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THE JOURNAL OF THE MINISTRY OF AGRICULTURE

VOLUME XLIII

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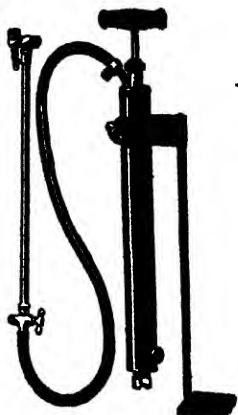
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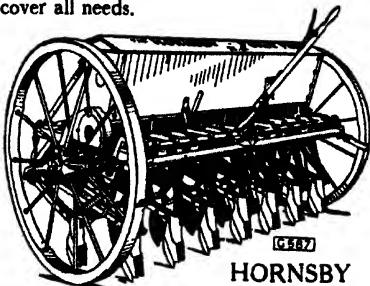
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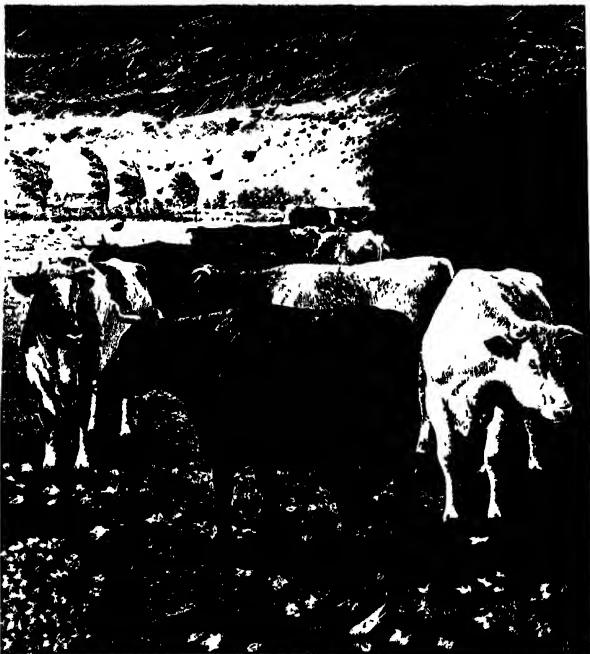
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Vol. XLIII No. 7 October, 1936

NOTES FOR THE MONTH

Agricultural Education in Yorkshire : Developments at Askham Bryan

THE machinery for the provision of agricultural education in Yorkshire is unique by virtue of the co-operation between the three Ridings working through the Yorkshire Council for Agricultural Education. The scheme financed by the Council at the present time includes the teaching at the Department of Agriculture of Leeds University, where degree, diploma and short courses are given, and, in addition, the normal county activities, such as day and evening classes, lectures, etc., throughout the Ridings. Steps are now being taken to complete these educational facilities by the erection of a farm institute.

The present farm of 349 acres at Askham Bryan, near York, was acquired in 1927, and a scheme for establishing there a residential farm institute, suitable for providing three-term and shorter courses, came under consideration. Details had been worked out and general principles agreed between the Authority and the Ministry in 1931, but progress was held up by the economy measures of that year. The Council have since revived the proposals, and Treasury authority has now been given to a total capital expenditure not exceeding £85,000. The administrative, teaching and residential buildings are now in course of construction and will provide accommodation for 30 men and 30 women students, being capable of extension at a later date for a total of 120 students; the cost of this portion of the scheme will be about £60,000. The remaining outlay defrays the acquisition of an additional 180 acres of land and the erection of farm buildings to allow for the development of dairying and cattle breeding at the farm, and for the establishment of a horticultural unit.

NOTES FOR THE MONTH

British Commonwealth Scientific Conference

THE British Commonwealth Scientific Conference, attended by representatives appointed by Governments of the United Kingdom, of all the Dominions, of India and of the Colonies, was opened at No. 6, Burlington Gardens, London, W.1, on September 21. In opening the Conference, the Minister of Agriculture, the Rt. Hon. Walter Elliot, M.C., M.P., referred to the valuable co-operative work in agricultural science effected through the Executive Council of the Imperial Agricultural Bureaux—a body consisting of representatives of all Empire Governments, and inter-Imperially financed. The review of the work of this Council formed one of the main objects of the present Conference. A vote of thanks to the Minister was proposed by Major-General A. G. L. McNaughton, of the Canadian delegation. The Conference then proceeded to elect Lt.-Col. Sir Charles Howell Thomas, K.C.B., K.C.M.G., as Chairman. Sir Charles, who is Chairman of the Executive Council of the Imperial Agricultural Bureaux, gave a short address, in which he reviewed generally the work before the Conference.

The Conference then proceeded to the election of two Standing Committees, under the Chairmanship respectively of Major-General McNaughton and of Dr. P. R. Viljoen, of the South African Delegation. After preliminary discussion, the various items of the Agenda were referred to one or other of these Committees. The Conference then adjourned till Friday, October 2, and in the interval will tour the various scientific centres in Great Britain in whose work they are particularly interested.

National Rat Week, November 2-7, 1936

NATIONAL RAT WEEK begins this year on Monday, November 2, and the Ministry appeals once again to all concerned to make a special effort during that week to destroy rats and mice and to take all possible steps to bring them under control.

The Rats and Mice (Destruction) Act, 1919, requires every occupier of land or premises to take steps to destroy any rats or mice on his property and to prevent the property from becoming infested. Some 720 local authorities in England and Wales are responsible for the enforcement of the Act in their respective areas, and the Ministry has addressed a circular letter to these authorities asking for their co-operation

NOTES FOR THE MONTH

in this year's campaign. It is suggested that each authority should arrange for concerted action to be taken by the occupiers of any premises in its area that are known to be infested by rats, and for special measures to be taken in connexion with rubbish dumps, sewage farms, and other properties that are particularly liable to infestation.

Local authorities are also urged to give publicity to the need for destroying rats and mice by distributing literature on the subject, and arranging for the display of the coloured "National Rat Week" poster which has been issued by the Ministry, and of a new sound version of the Ministry's rat film that is now being prepared.

The Ministry's Advisory Leaflet No. 49 on the "Destruction of Rats and Mice" contains much useful information and advice, and a copy of this Leaflet, together with a pamphlet that makes simple suggestions for rat destruction and a list of firms from whom poisons, etc., are obtainable, may be obtained free of charge on application to the Ministry.

Further information on the subject is contained in the Ministry's Bulletin No. 30, "Rats and How to Exterminate Them," copies of which are obtainable through any bookseller, or direct from His Majesty's Stationery Office, price 6d. (7d. post free).

What is Good Farming?

ANYONE who attempts to answer the question "what is good farming?" lays himself open to very considerable criticism. Mr. C. S. Orwin, however, is always fearless in his attack upon all agricultural problems, and in choosing the above title for a paper to read to the Incorporated Society of Auctioneers and Landed Property Agents at an agricultural conference at King's Lynn on Wednesday, September 2, he threw down the gauntlet to many a "Mr. Standfast."

One may always expect fertile ideas in a contribution by Mr. Orwin. He is almost the Bernard Shaw of agricultural writers, and in this sphere he has maintained his reputation for regarding the agricultural problem from an original angle. After a brief historical introduction he postulates the four classic ideas of good farming. These were: (1) good farming is high farming; (2) good farming is mixed farming; (3) good farming is rotation farming; (4) grass farming is good farming; and proceeds to demolish these ideals. High farming is perhaps the easiest to dismiss. He pointed out that, in the

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depression of the nineteenth century, Sir John Lawes laid down the dictum that high farming is no remedy for low prices. He added, " I am not saying that many farms could not be farmed higher with profitable results. All I mean is that big crops and pedigree stock do not necessarily make a profit balance, and if they do not, then the farming is not good."

Mixed farming is our tradition. It was the backbone of all English farming for centuries and founded the prosperity of the eighteenth century, out of which came much of the capital to support our industrial development. Since the invention of modern fertilizers and modern machinery, however, the necessity for directing the activities of the farm towards the production of large quantities of animal manure is not so essential as it was. This has been demonstrated by a number of farmers whose stories have been told in the series "*Progress in British Farming Systems*," edited by Mr. Orwin himself. Again, Mr. Orwin points out that he does not wish to be misunderstood. He wants to suggest that if mixed farming does not pay it must not be assumed that no profitable substitute for it can be found.

Another tradition that is inbred in the theory of British farming is that a rotation of crops is necessary, and also that particular rotations must be followed on particular soils. Indeed, many leases, as Mr. Orwin says, demand that particular rotations should be followed on a farm rented. Two things occur to us at once in considering these covenants. First, most of them have come down to us with little or no change from many years ago; secondly, farmers all over the country take very little notice of them. Mr. Orwin maintains that to seek to dictate how the land is to be farmed by means of a cropping covenant that has been copied in the estate office year after year from old tenancy agreements, is to ignore all that we have learnt, in the last generation or so, about the maintenance of soil fertility, to overlook the new means at our disposal for keeping the land clean by mechanical power, and to fail to appreciate the changed economic conditions that have made many of the old farming practices and farm products inappropriate.

That grass farming is good farming is the last bogey to be dispelled. We are rightly proud of our grass land, but Mr. Orwin suggests that much of the grass land of England is full of stored-up fertility that cannot be cashed except by ploughing and cropping, and that there are thousands of

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acres of grass land that would be more profitable, to landlord and tenant alike, under a system of alternate husbandry. The work of Professor Stapledon in Wales has long passed the experimental stage, and it has proved conclusively that the productivity of much of the land now under permanent grass could be increased by ploughing, cropping and re-seeding from time to time.

So he admits that the answer to the question "what is good farming?" is not provided by any of these four. For himself, he feels that the resources of modern scientific and technical knowledge, expressed in the cheap fertilizers and the cheap power now available to the farmer, and the changes in the economic situation—due, on the one hand, to the position of Britain as the principal market for the world's surplus agricultural production, and, on the other hand, to the assistance now being given by the Government to certain forms of home production by the marketing schemes, by subsidies, and by import duties and restriction—have changed the whole position on the land. To-day it is so flexible that it is impossible to define good farming by reference to practices that may have been perfectly sound even a few years ago; and the answer to the question he provides is: "Good farming is not necessarily high farming, nor mixed farming, nor farming to a prescribed rotation, nor preserving grass land. It is any farming which maintains the cleanliness and the fertility of the land while enabling the farmer to pay his labour, to pay his rent and get the best possible living for himself." This seems to be sound common sense, and even though, to a few people, it may seem to be almost self-evident, it is worth saying at the end of such an illuminating discussion of the subject.

Precautions Against Boiler Explosions

FROM time to time, steam boilers used for agricultural purposes have exploded with disastrous results; and in view of the increasing use of steam-raising plant on dairy farms, it is essential that precautions should be taken to ensure that steam boilers are maintained in proper condition for efficient service and that they are worked in a safe way.

The Boiler Explosions Acts, 1882 and 1890, make provision for investigation by the Board of Trade of all explosions of boilers, whether portable or stationary, that occur in this country; while the Factory and Workshop Act,

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1901, requires that every steam boiler used for generating steam in a factory or workshop, or in any place to which any of the provisions of the Factory and Workshop Act apply, shall be examined thoroughly by a competent person at least once in every fourteen months. Dairies in which the manufacture of butter, cream, cheese and ice cream and the sterilizing, homogenizing or pasteurizing of milk are carried on are regarded as coming within the provisions of the Factory and Workshop Act.

The owner or user of a steam boiler installed on farm premises, or taken to a farm for temporary service, should not fail to adopt the following precautions:

(1) The boiler should be of safe construction and constantly maintained in a safe condition.

(2) The boiler should be provided with the necessary fittings of satisfactory design for safe service—e.g., safety valve, water and steam pressure gauges—which should be properly maintained.

(3) The boiler, including all the safety fittings, should be thoroughly inspected both when standing and when under steam at sufficiently frequent intervals by a competent person, who should state in writing the condition of the boiler as revealed by the inspection, the safe working pressure for the ensuing period till the next inspection, the repairs (if any) necessary and the period within which they must be completed. If the boiler is unfit to be put into service again or until specific repairs are carried out, the inspector should so report.

Farmers are strongly advised to follow the now almost universal practice of factory occupiers, viz., to insure their steam boilers with a reputable boiler insurance company; such a company employing trained inspectors to make the necessary thorough examinations and to furnish reports.

It must be emphasized that boilers should, in no circumstances, be left in the care of a young and inexperienced person; and the safe working of a steam boiler cannot be assured unless a trained, intelligent workman is placed in charge of it. Farmers who have the opportunity would find it well worth while to visit, and to arrange for their workmen concerned to visit, the Home Office Industrial Museum, Horseferry Road, Westminster, London, S.W.1, where the exhibits, designed to show the different methods by which safety of machinery, etc., is secured, include a special section dealing with the working of boilers.

Poisoning of Fish by Derris

THE Ministry desires to draw the attention of farmers, fruit growers and others to the poisoning of fish which may be attributable to the presence in rivers or streams of solutions or

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powders containing derris root or rotenone or any preparation made from derris root.

Derris preparations are now used extensively in agriculture and horticulture. Under the Warble Fly (Dressing of Cattle) Order of 1936, derris dressings are prescribed for the treatment of cattle infested with warble fly; and derris preparations are also in use as insecticides for the control of certain insect pests of fruit and vegetable crops.

When using derris preparations, care should be taken to prevent any of the solution or powder entering rivers or streams containing fish. The practice of the washing, or the indiscriminate dumping, of containers of derris preparations in rivers or streams is to be strongly condemned. The Ministry accordingly appeals to all users of derris insecticides to take every possible precaution to prevent the poisoning of freshwater fish from this cause.

Capital Grant to the University College of Wales, Aberystwyth

TREASURY authority has been obtained for a grant not exceeding £15,000, on a £ for £ basis, for the erection and equipment of a new agricultural research building for the Welsh Plant Breeding Station and the College Advisory Department of Agricultural Economics.

The College proposes to transfer a number of departments, together with the Great Hall and administrative headquarters, to a freehold site on the outskirts of Aberystwyth and close to the National Library of Wales. The erection of new buildings will be carried out in the order determined by the urgency of the need for new accommodation, and on this basis the College Council has placed the agricultural research block first on the list.

The Agricultural Buildings, in which the Welsh Plant Breeding Station and the Agricultural Economics Advisory Department are now housed, were first occupied in 1922, but, owing to the expansion of the work of the departments concerned, these buildings are extremely overcrowded and are also unsatisfactory in other respects. Apart from the provision of adequate accommodation, the transfer of the Station to the new site will have the advantage of bringing it into proximity with the experimental gardens, and also much closer to the College Farm at Frongoch.

The new building, designed by Mr. Percy Thomas, O.B.E.,

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the President of the Royal Institute of British Architects, will be the first instalment of the well-conceived and finely-situated buildings for the University College of Wales. It will comprise office, laboratory and library accommodation, conference room, herbarium, etc., and is estimated to cost about £26,000, to which must be added about £4,000 for approach and site works and the necessary equipment. In view of the close connexion between the work of the Welsh Plant Breeding Station and that of the Imperial Bureau of Plant Genetics (Herbage Plants), it is intended to arrange for the accommodation of the Bureau in the new building.

It is hoped to complete the building in time for the Fourth International Grassland Congress, which will be held in Aberystwyth in July, 1937, under the Chairmanship of Professor R. G. Stapledon, C.B.E., the Director of the Welsh Plant Breeding Station.

Cereals for Autumn Sowing

THE following note has been communicated by the National Institute of Agricultural Botany, Huntingdon Road, Cambridge :—

By the careful choice of suitable varieties of cereals, the farmer should be able to add materially to his returns. For the last fifteen years, the National Institute of Agricultural Botany has conducted systematic field trials with the more promising varieties, and is able to give reliable advice to farmers in the North Midlands, Midlands, South and East of England on the choice of varieties of wheat, barley and oats.

No one variety of any cereal succeeds equally well everywhere; its suitability for conditions of high, moderate or low fertility must be taken into account. In addition to yield and quality of grain, it is frequently important to consider length of straw and its resistance to lodging, and such points as winter hardiness, time of ripening and disease resistance.

Farmers have a wide range of good winter wheats from which to choose, among the best of them being Victor, Wilhelmina, Juliana, Yeoman, Yeoman II, Holdfast, Little Joss, Steel, Rivett and Squarehead's Master or Standard Red.

As regards choice of barley, where winter hardiness is of first importance, the ordinary six-row winter is most satisfactory. Under favourable conditions, Plumage-Archer or Spratt-Archer both withstand normal winters and give good malting samples as well as high yields.

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Among winter oats, Grey Winter and Black Winter are the most hardy. On richer soils, Bountiful stands better but is not so hardy. Where extreme winter hardiness is not required, and for very fertile soils, Resistance can be recommended on account of its resistance to lodging, good quality straw and very high yields. The use of the term "White Winter" as a varietal name for oats should be avoided, as it is ambiguous.

Brief particulars of the purposes for which the above varieties are adapted are given in Farmers' Leaflet No. 1, copies of which can be obtained free of charge from the Institute, as above, or from any County Agricultural Organizer; and inquiries about these or other varieties are always welcome.

Agricultural Research Scholarships and Studentships

ON the recommendation of the Agricultural Research Council, post graduate Scholarships, tenable from October 1, 1936, have been awarded by the Ministry as follows:—

Three-year Scholarships :—

R. Brown	(Botany)
R. A. Webb	(Mycology)
G. P. Wibberley	(Agricultural Economics)

One-year Scholarship :—

I. W. Selman	(Physiology)
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No Studentships for Research in Animal Health were awarded this year to applicants from England and Wales, but the Studentship awarded to H. Wilkinson in 1934 has been renewed for a further period of four years from October 1, 1936, to enable him to take a course of study at a Veterinary College for the diploma of M.R.C.V.S.

These awards are made with the object of training research workers, and thus to advance agricultural science and scientific studies bearing on animal health.

National Dairy and Ice Cream Convention

THE National Dairy and Ice Cream Convention will take place at the Crystal Palace from January 26 to 29 next. Plans for the exhibition to be held in connexion with this Convention have now been issued, and show an increase of 9,372 square feet in exhibition space over that provided at the last exhibition. Already more than three-quarters of the space has been allotted, and it is anticipated that there will be a record attendance at the Convention. Further particulars may be obtained on application to the Organizer, National Dairy and Ice Cream Convention, 8 Mitre Court Chambers, London, E.C.4.

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Diseases of Animals in 1935

THE Report of Proceedings under the Diseases of Animals Acts for the year 1935, recently issued,* opens with a reference to the enactment of the Diseases of Animals Act, 1935, which makes provision for the application of the existing Acts to poultry, and confers powers upon the Ministry for the regulation of the manufacture and importation of therapeutic substances intended to be used solely for veterinary purposes. A general indication of the principles that will govern the exercise of the new powers is given in Part I of the Report. Part II describes the position of Great Britain with regard to the twelve notifiable diseases and records its continued freedom from cattle plague, pleuro-pneumonia, sheep pox, rabies, epizootic lymphangitis, glanders and dourine.

The number of outbreaks of foot-and-mouth disease was 56, distributed among 13 centres involving 9 English counties, one Welsh and one Scottish county. Scotland had previously been entirely free from the disease for $3\frac{1}{2}$ years. Outbreaks of this disease continue to be dealt with by what is known as the slaughter policy.

A substantial reduction (30·3 per cent.) in the incidence of sheep scab is recorded as the result of the intensive measures of the past two years. There was also a decrease (2·3 per cent.) in the number of outbreaks of anthrax, and a further decline (13·9 per cent.) in the number of outbreaks of parasitic mange in horses. On the other hand, the number of outbreaks of swine fever increased by 11·8 per cent. as compared with 1934.

Details are given as usual to show the results of the administration of the Tuberculosis Order of 1925 by Local Authorities. The number of cattle examined by veterinary inspectors was 415,667 on 25,032 farm premises as against 393,343 cattle in 1934, and the number of cattle actually slaughtered under the provisions of the Order, further increased by 228 to 22,237. This part of the Report describes the institution of the Tuberculosis (Attested Herds) Scheme made under Section 9 of the Milk Act, 1934, and the difficulties that have accounted for the slow progress of the Scheme.

* Report of Proceedings under the Diseases of Animals Acts for the Year 1935: H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2. Price net. 2s. (postage 2s. 2d.).

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Part III of the Report describes the measures taken to prevent the introduction and spread of disease in this country. The only instances of a scheduled disease found amongst imported animals were 54 cases of sheep scab—22 from Northern Ireland and 32 from the Irish Free State.

Part IV describes the administration of the measures for the protection of animals and poultry from unnecessary suffering during transit by sea, rail or road. The records show that the percentage of casualties among the large number of animals carried by sea continues to be negligible.

Part V deals with the certification of exported pedigree and other livestock and raw animal products to comply with the regulations of the importing countries, where it is required that such certification must be made under the Ministry's authority. Particulars of the working of the London Quarantine Station are included.

Part VI is a miscellaneous section that includes a reference to the annual Meeting of the International Veterinary Bureau in Paris and a description of the Warble Fly (Dressing of Cattle) Order of 1926 and of the circumstances that led up to its issue.

The volume includes a separate report by the Director of the Ministry's Veterinary Laboratory and Research Institute at Weybridge, reviewing the diagnostic and research work carried out at that institution.

The Appendixes to the Report contain the usual statistics as to scheduled animal diseases confirmed in each county in Great Britain, the livestock population, animals imported and exported, numbers and breeds of stock exported with the Ministry's certificates, and the incidence of certain animal diseases in European countries. Full particulars of the Ministry's Attested Herds Scheme are also included.

World's Dairy Congress, 1937

It is announced that the Eleventh World's Dairy Congress will be held in Berlin from August 22-28, 1937. The Congress will be divided into several sections for the purpose of discussion and the reading of papers on various aspects of the milk industry.

During the period of the Congress there will be held an International Dairy Exhibition, at which opportunity will be given to countries to demonstrate their outstanding improvement in marketing and in the treatment and processing of

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milk. There will also be held an international competition for dairy products and an international dairy-machinery exhibit.

Arrangements for the representation of the dairying industry in this country, at the Congress, are in the hands of the British Dairy Farmers' Association. Full information may be obtained on application to the Secretary, British Dairy Farmers' Association, 28, Russell Square, London, W.C.1.

Sampling Observations on Wheat, 1935-1936 : Report for Fourth Quarter

THE results of the fourth year's sampling observations on wheat are of special interest, as the weather conditions have been entirely unlike those of the last three years.

The full table of observations taken in the fourth quarter is presented in the customary form in Table II. The mean yields of the two standard varieties grown at each station are given in Table I, which also shows the means of the yields obtained at each station over the previous three years, and the predictions of the yields for 1936 from the shoot heights at ear emergence and plant numbers at tillering. The

TABLE I.—OBSERVED AND PREDICTED YIELDS

	Mean 1933-35	1936	Predicted 1936	Observed less Predicted
Seale-Hayne	25·9	23·1*	26·0	-2·9
Rothamsted	29·7	31·8	30·9	+0·9
Newport	39·7	32·2*	(44·2)	—
Boghall	32·7	28·4	21·3	+7·1
Sprowston	24·7	21·4*	30·0	-8·6
Plumpton	39·4†	22·6*	31·4	-8·8
Mean	32·0	26·6		-2·5
Wye	24·6	20·8	21·5	-0·7
Long Sutton	20·5†	27·4	—	—
Woburn	25·1	21·3	27·4	-6·1
Cirencester	30·0†	24·1	25·6	-1·5
Mean of all ..	29·2	25·3		-2·6

* July and August damage reported by observer.

† Plumpton and Long Sutton are means of two years and Cirencester of one year only. In each case the means are adjusted so as to be comparable with those of the other stations over the same set of years.

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TABLE II.—SAMPLING OBSERVATIONS ON WHEAT, 1935-36, FOURTH QUARTER

Station	Variety	Last observations before harvest:			Date for cutting	Date of harvest	Distance between rows in.	Yields and standard errors of differences in cwt. per acre.			
		Date	Ear Density per 3in.	Ear height cm.				Grain	S.E. of diff.	Straw	S.E. of diff.
CHESTER, Gloucestershire ..	S.H.M. ..	Aug. 7	1,361	96.9	Aug. 12	6.0	23.6	42.6	23.3	37.9	± 2.74
	Yeoman ..	Aug. 7	1,439	87.3	Aug. 12	6.0	24.6	37.6			
	Victor ..	Aug. 7	1,249	86.9	Aug. 12	6.0	23.3	37.9			
LONG STATION, Hampshire ..	S.H.M. ..	Aug. 8	—	105.1	Aug. 10	7.0	26.9	40.0	2.8	40.2	± 1.42
	Yeoman ..	Aug. 8	—	103.8	Aug. 10	7.0	27.8	40.2			
SPROWSTON, Norfolk ..	S.H.M. ..	Aug. 10	1,363	109.1	Aug. 10	6.75	22.8	29.6	2.8	26.5	± 2.25
	Yeoman ..	Aug. 10	1,359	94.2	Aug. 13	6.75	23.9	27.6			
WOBURN, Bedfordshire ..	S.H.M. ..	Aug. 17	1,596	111.8	Aug. 17	7.8	18.3	54.3	2.3	53.2	± 2.80
	Yeoman ..	Aug. 17	1,679	104.6	— [†]	Aug. 17	7.8	24.3			
SEALE-HAYME, Devonshire ..	S.H.M. ..	Aug. 1	1,764	106.5	Aug. 9	7.0	23.8	45.0	2.4	40.7	± 2.46
	Yeoman ..	Aug. 1	1,759	95.0	Aug. 12	7.0	22.4	27.8			
GARSTON'S NO. 60	Garton's No. 60	Aug. 4	1,774	105.4	Aug. 10	7.0	26.0	47.0	2.4	58.3	± 3.14
	S.H.M. ..	Aug. 10	1,438	109.6	Aug. 13	6.0	31.3	51.9			
ROTHAMSTED, Hertfordshire ..	Yeoman ..	Aug. 10	1,758	100.9	Aug. 15	6.0	32.3	61.9	2.4	62.4	± 3.14
	Victor ..	Aug. 10	1,335	105.7	Aug. 15	6.0	36.4	47.0			
NEWPORT, Shropshire ..	S.H.M. ..	Aug. 26	—	108.3	Aug. 24	6.0	31.9	67.5	2.4	68.3	± 6.45
	Yeoman ..	Aug. 26	—	119.1	Aug. 26	6.0	29.6	67.5			
PLUMPTON, Sussex ..	S.H.M. ..	Aug. 17	1,035	100.7	Aug. 17	7.0	23.1	22.4	2.0	24.9	± 1.26
	Yeoman ..	Aug. 17	1,366	93.4	Aug. 16	7.0	24.0	27.1			
BOGHALL, Edinburgh ..	S.H.M. ..	Sept. 9	1,077	100.0	Sept. 10	6.0	28.8	56.8	2.1	51.7	± 2.68
	Yeoman ..	Sept. 9	1,347	93.0	Sept. 14	6.0	28.1	51.7			
WYE, Kent ..	S.H.M. ..	Aug. 8	1,408	86.6	Aug. 8	7.0	22.0	32.9	2.3	30.3	± 2.36
	Yeoman ..	Aug. 8	1,448	77.9	Aug. 10	7.0	19.6	30.3			

* Both varieties slightly unripe at harvest.

* Squarehead's Master.

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relations found to hold between these three quantities in the first three years were described in the May number of this JOURNAL.

The table presents several interesting features. The mean yield over all stations, 25·3 cwt. per acre of undressed grain, though substantially below the mean of the three previous years, namely 29·2 cwt., cannot be taken as indicating a disastrous crop failure. For the first six stations shown in the table, which are those that have distinctly less variability in yield from year to year than the other four, the drop from 32·0 to 26·6 cwt. is somewhat greater. The lower mean yield this year, however, has not been caused by partial or complete crop failure at a few of the stations, but by the absence of any outstanding yields such as were a feature of the last three years. Only at Long Sutton and Rothamsted have the yields this year exceeded the means over the previous three years.

One of the most remarkable yields is that of Newport. This station was singularly unfortunate, because weather conditions delayed sowing till the end of November and continued so bad that the wheat did not appear above ground till the end of January. An exceptionally poor stand was obtained, the plant number at tillering being only 390, as compared with a mean of about 1,250 for all stations in 1933-5. The crop came on remarkably, however, tillering being so vigorous that the maximum number of shoots was of the order of 2,250, dropping to 1,400 at ear emergence. At the beginning of July the plots looked very promising, and, in spite of serious damage owing to the wet weather and

TABLE III.—DRY MATTER OBSERVATIONS

Station and Variety	Dry Matter		Dry Matter		Dry Matter		Yield	
	(cwt. per acre)	Per cent	(cwt. per acre)	Per cent.	(cwt. per acre)	Per cent.	cwt. per acre	
	Grain	Straw						
NEWPORT								
S.H.M.*	68·0	31·7	80·6	39·5	82·4	46·0	34·9	67·5
Yeoman	57·8	30·1	76·0	37·4	77·9	44·4	29·6	68·5
S.E. of Diff. . .	± 3·93	± 0·594	± 6·58	± 0·666	± 4·22	± 0·604	—	—
ROTHAMSTED								
	July 13-14		July 27-29					
S.H.M.	67·2	36·2	72·6	42·7	—	—	31·3	58·2
Yeoman	56·5	36·8	70·3	43·7	—	—	32·3	61·9
Victor	58·0	35·0	76·0	41·6	—	—	36·4	62·4
S.E. of Diff. . .	± 3·68	± 0·649	± 3·41	± 0·530	—	—	—	—

* Squarehead's Master.

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TABLE IV.—OBSERVERS' REPORTS AT HARVEST

Scalbyayne ..	"Crop laid in parts. Rabbit and bird damage reduce yield considerably."
Rothamsted ..	"All varieties partially lodged, but not enough to effect yield seriously."
Newport ..	"The yield of Yeoman seriously reduced owing to large number of shrivelled grains which . . . may be due to a host of factors. S.H.M. also slightly affected."
Boghall ..	No remarks.
Sprowston ..	"Some lodging on all plots, but very pronounced on S.H.M. in block A. Lodging more severe on S.H.M. than on Yeoman."
Plumpton ..	"Knocked about badly by the bad weather of July. Rather heavily attacked by sparrows. Yeoman rather badly attacked by smut."
Wye ..	No remarks.
Long Sutton ..	No remarks.
Woburn	"Not quite ripe. About 10 per cent. bird damage in July on S.H.M."
Cirencester ..	"Yeoman not quite so ripe as S.H.M. and Victor." attendant pests in July, the highest yield of any station was obtained.

The predicted yields are, on the average, somewhat above those realized, and, at first sight, it would appear that the relations observed in previous years have not been repeated under the altered weather conditions of this season. On examination, however, it will be seen that, with the exception of Woburn (which reported slight bird damage and is believed to give yields low compared with prediction in all years), all the large deficiencies are at stations at which serious July damage was reported by the observers. (The harvest reports of all observers are given in Table IV.) Although no exact estimates of this damage are available, it is reasonable, from the remarks of the observers, to suppose that it was of the order of 5-10 cwt. per acre. Newport is outside the range of the prediction formula (owing to the very low plant number referred to above), but even here the predicted yield, bearing in mind the July damage, is surprisingly near that observed. A prediction made in June cannot, of course, be expected to foretell damage occurring in July. The Scottish station, Boghall, has given a yield substantially higher than that predicted.

The results of this year, therefore, taken as a whole, are a remarkable illustration of the recuperative powers of the wheat crop, and its adaptability to varied weather conditions. Were it not for the exceptionally wet July, it seems probable that the mean crop would have been but little below the average.

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Another striking effect of the unseasonable weather this summer is the lateness of the harvest. Excluding Boghall, the mean date of harvest this year, August 15, is ten days later than last year, and twelve days later than 1934. Boghall was not harvested this year till September 10-14, over a fortnight later than usual.

An additional locally-chosen variety was grown at three stations this year. Victor at Rothamsted and Garton's No. 60 at Seale-Hayne both yielded about 15 per cent. above the mean of the standard varieties. At Cirencester, Victor gave about the same yield as the standard varieties. Yeoman has done significantly better than Squarehead's Master at Woburn, while the reverse is the case at Newport, but, on the average, there is little difference in yield between the two standard varieties.

Dry matter samples were again taken by Rothamsted and Newport. The accompanying table (Table III) shows the results of these observations.

Agricultural Careers

A USEFUL pamphlet* giving advice and information on the subject of agricultural careers, has just been compiled by the Ministry of Labour in collaboration with the Incorporated Associations of Headmasters and Headmistresses of Public Secondary Schools. The pamphlet deals primarily with general agriculture, but also includes information on dairying, horticulture, poultry husbandry and forestry. Detailed reference is made to the educational facilities provided or supervised by the Ministry of Agriculture, and to the qualifications necessary for a successful agriculturist. The chief opportunities in the industry are stated to consist in independent farming (including dairying and poultry husbandry) and horticulture; in salaried work on the land; in commercial farms at home and abroad; on the staffs of Government Departments at home and abroad; on the staffs of local authorities; in teaching appointments; and in research work. A section is devoted to each of these branches, the prospects and possibilities being stated in a clear and authoritative manner that should prove helpful to boys and girls, parents, teachers, and all who are concerned in advising children from public and secondary schools in the choice of an agricultural career.

* *Agriculture, Horticulture and Forestry : Choice of a Career Series*, No. 25. Pp. 20. Obtainable from His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C.2, price 4d., post free 5d.

**OUR CHANGING AGRICULTURE :
THE DISTRIBUTION OF ARABLE LAND IN THE ADUR BASIN,
SUSSEX, FROM 1780 TO 1931.**

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WHEN making a particular study of the Adur Basin, the writer found occasion to go out into the field and map the crop distributions on six-inch maps. From this record he constructed Map I, showing the actual field distribution of ploughland in 1931. This map brings out several interesting features, particularly the three-fold division of the Basin from an agricultural point of view into a Coastal, a Downland, and a Wealden zone, with the somewhat patchy aspect of the first two, and the belted distribution of the third. The extent of building in the Coastal zone is an obvious reason for a patchy distribution there, since houses necessitate the absence of cultivation. For example, at Worthing, there are two quite separate areas of ploughland on the east and the west of that town; similarly, the cultivation does not extend so far eastwards as does the Coastal Plain, because of the westward spread of Hove. The absence of arable land to the west of Shoreham is due, however, to different causes: in the first place, this is an area of alluvium, fine in texture, subject to sea-flooding in places and therefore in part consisting of salttings, and secondly, a considerable acreage is occupied by Shoreham aerodrome, which has been enlarged and opened as the Brighton and Worthing Airport in the present year.

The surface known geologically as the "Brickearth" has been so largely built over that the percentage of arable land (14·6) fails to reflect adequately the qualities of its soils; on the Marine Gravel 42 per cent., and on the Coombe Deposits (or Shrave) 29 per cent. was under the plough in 1931. The total proportion of the Coastal Plain arable was 35 per cent., a remarkably high figure having regard to the extent of land built over.

The arable land in the Downland zone is found to lie either in the lower portions of the southward facing valleys or on the flanks of the river gap of the Adur; the arable area is, as a rule, below the 300-foot contour, very little being above 450 ft. O.D. The soils of the hill-tops are notoriously thin, those of the valley floors deep and loamy; this offers one explanation of the distribution of arable land, but a further reason for

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the prominence of the valleys appears to be the shelter they afford from the prevalent south-westerly winds. Another influence is undoubtedly accessibility, for the spread of ploughland through the Downland zone is found only on the lines of the through routes of the Worthing-London, the Brighton-London and the Brighton-Lewes roads.

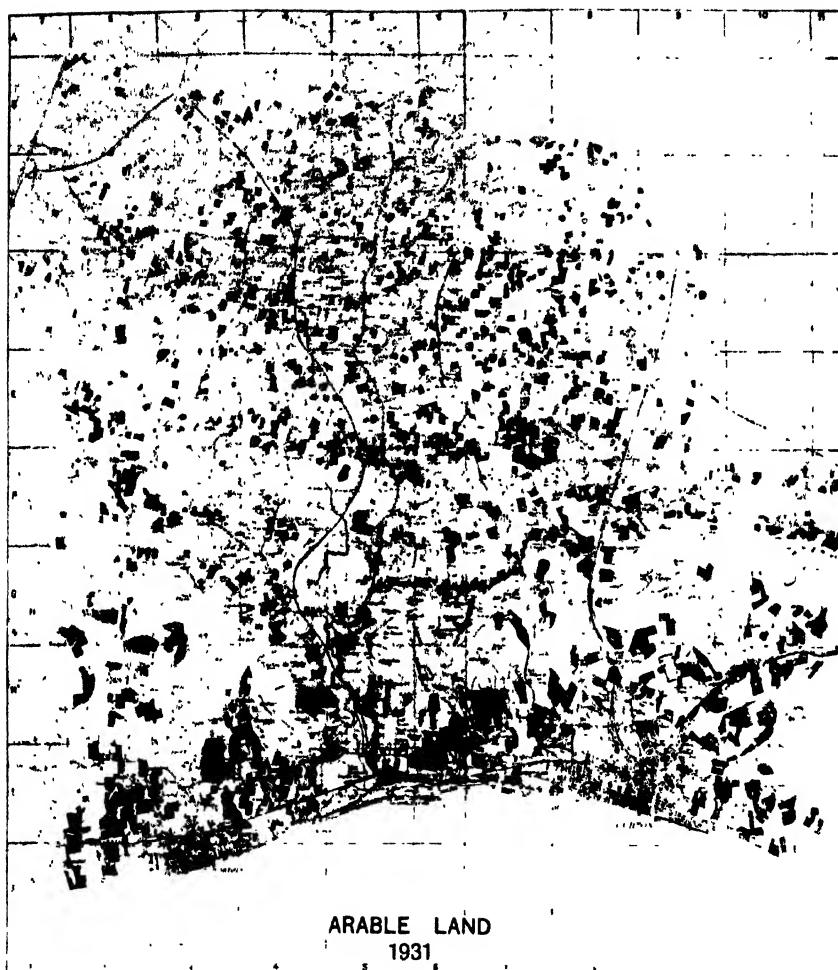
In all, the Downland zone had 8,515 acres under the plough in 1931, of which total 7,504 acres were on the Upper Chalk, 810 acres on the Middle Chalk, and 201 on the Clay-with-Flint soils; proportionate to the areas of these soils the arable land represents 19·5 per cent. of the Middle Chalk, 17·1 per cent. of the Upper Chalk, and only 9·3 per cent. of the Clay-with-Flints, while the total figure is equivalent to only 17·0 per cent. of the Downland zone, taken as a whole.

In the Weald, at first glance, the arable land appears more evenly distributed, but closer inspection of the map shows that at its southern edge there are two narrow arable belts separated from each other by a much wider zone almost completely devoid of ploughland. The former of these two arable belts lies on the soils of the Lower Chalk and Upper Greensand platform,* a platform which, in this part of the country, is very narrow. The zone of unploughed land lies on the heavy clay soils of the Gault, upon which the 1931 crop survey shows a mere 73 acres of arable. The second belt of ploughland is on the geological outcrop known as the Hythe Beds, that is to say the lowest and oldest of the three divisions of the Lower Greensand, yielding soils that are loamy in texture and well supplied with plant food. The other two divisions of the Lower Greensand are both relatively infertile, the younger Folkestone Beds yielding a very light soil described by Topley† as "a loose sand which can be vastly improved by marling from the Middle Gault"; on these there is a certain amount of arable land, but the intermediate Sandgate Beds consist of clay soils that are ploughed only where they lie within the boundaries of a field in which the soils are mostly Hythe.

To the north of this narrowly-zoned area lies a wide belt of Weald Clay soils, which include certain sandy belts

(*) Owing to a geological flexure, these scarp-foot beds run to the north-west from Poynings to Henfield, and then reassume a west-east strike.

(†) W. Topley, Agricultural Geology of the Weald, *J. R. Agric. Soc.*, Vol. 8, Sec. 2, 1872.



ARABLE LAND
1931

Photo: Dr. Henderson

MAP NO. 1 Actual field distribution of ploughland in the Adur Basin, Sussex, in 1931



Proc. D. H. Cole

MAP NO. II - Distribution of arable land in the Adm. Boro, Sussex, 1875.

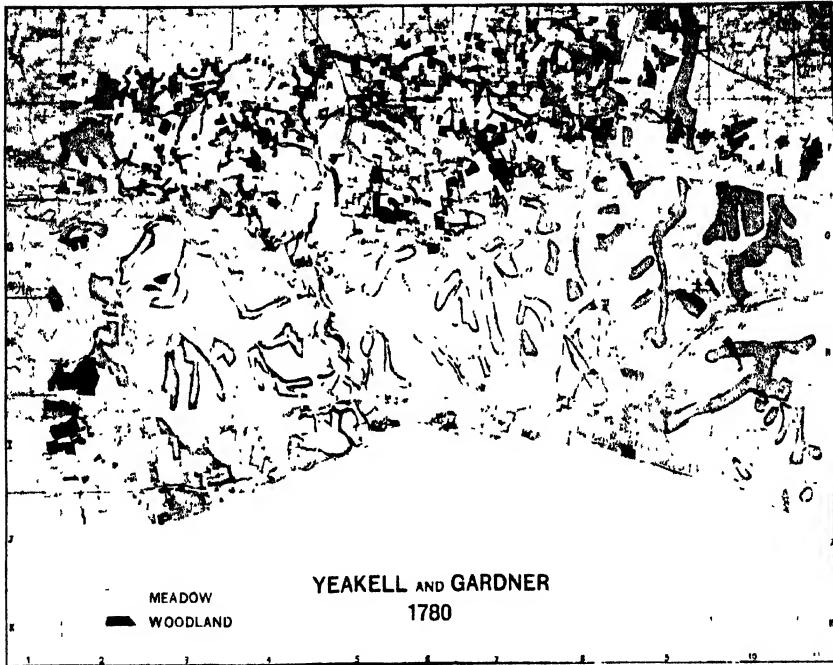


ARABLE LAND

TITHE

Drawn by Hervey.

MAP NO. III.—Distribution of arable land (tithe) in the Adur Basin, Sussex—records
between 1837 and 1850.



MAP NO. IV Land in the Adur Basin, Sussex indicated by Yeakell and Gardner (1780) as being other than arable land

Printed by Dr. Hawkes

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described originally by P. J. Martin in his "Geological Memoir of a part of Western Sussex," published in 1828. One of these sandy belts makes itself very evident on the 1931 map as a line of arable land running from Coneyhurst Common (C.2) to Twineham (D.6). On the Weald Clay proper there is very little ploughland at all in the western part of the area surveyed, but, towards the east, where the outcrop becomes narrower, it achieves a very reasonable proportion for a type of clay soil which, in most parts, becomes adhesive in wet weather and cracks badly in periods of drought, such as have occurred in the last three summers, 1933-34-35. North of this clay zone lies an area of somewhat higher land, composed of Tunbridge Wells Sands, the soils on which are light sandy loams, deficient in plant food and bearing a large amount of woodland. Most of the small amount of arable land on the Tunbridge Wells Beds lies on the Cuckfield Clay or the Grinstead Clay, both of which occur in very small patches and give lower relief, with the result that they are improved by downwash from the surrounding sands.

This method of going out into the field and recording agricultural distributions is not, of course, new, but, until recently, no maps have been produced from the records. Having duly collected the information and reduced to a scale of one inch to the mile, the writer decided to examine to what extent these modern distributions were paralleled in the past. The eighteenth-century reports published shortly after the foundation of the old Board of Agriculture, while giving useful written accounts for each individual county, included no maps of the actual distribution of crops or land utilization. Besides these, there are the valuable reports on various counties in the *Journal of the Royal Agricultural Society*, but these again make no attempt to show any actual distributions. There are, however, two very important sources of information of the type required: firstly, the records made following the Act of 1836 in connexion with the commutation of tithes, a record unfortunately incomplete, because so many parishes were not titheable for one reason or another, and hence the expense of a survey of them was not justified; secondly, the First Edition of the 25-Inch Plans of the country, published by the Ordnance Survey in the seventies and eighties of last century, had the field acreages recorded in so-called "area-books," instead of having them printed on the maps themselves, as is done in the later editions; while, in

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addition to the acreages, the earlier books quoted the land use of each field. After a time, the Ordnance Survey decided that to include the latter information was making the cost too high, and so this record also is not complete for the country. Indeed, the most complete mapped or mapable record of land utilization in this country is the modern Land Utilization Survey, carried out under the Directorship of Dr. L. Dudley Stamp.

The writer was more fortunate than many workers would be in that the whole of the Adur Basin was fully recorded in the Ordnance Survey area-books in 1875, and only six parishes were not completely surveyed for tithe purposes. There was actually only one parish that was entirely unsurveyed for tithe, but in the others either the record was of no use or a portion of the parish was not tithable.

The records of 1875 are very near to the peak period of arable land acreage in this country, and can therefore be assumed to show the maximum of ploughland in the history of the area. This record (Map II) shows that, despite the much greater amount of arable land in the region as a whole, the areas outstanding in 1931 were also prominent in 1875: thus, in the Coastal Plain region the soils, other than the alluvium, are arable except where buildings have spread over them. The alluvial flats at the mouth of the Adur provide one contrast in that good drainage has been secured, and most of the area covered by poor grassland or by Shoreham aerodrome in 1931, was under the plough in 1875. In the Downland region, while the factors of accessibility and shelter are still evident, the arable land spreads much farther up the valleys, and even over considerable areas of the plateau top. In the Wealden region, the southern soil belt-ing is again evident on this map, and the actual density of arable land on the Lower Chalk—Upper Greensand platform, and on the belt of Hythe Bed soils, is considerably higher than in 1931, so that these two belts still stand out as being particularly fertile despite the general tendency towards a much higher density on all soils. The dividing belt of Gault Clays is almost as negative as in 1931, the only portion that has many acres of arable land lying in the centre of the belt, between the Adur and Poynings (G.7). The Folkestone Beds carry a little more ploughland than in 1931, but the negative character of the very narrow belt of Sandgate Clays is striking, especially in the west of the region. The Weald

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Clay soils provide the outstanding feature of this map, for, in direct contrast to the evidence in 1931, these soils were extensively under the plough. What is more interesting is the fact that the western part is almost continuously arable, whereas on the modern map this appears as the least arable area of the Weald Clay soils.

A mere glance at the 1875 map gives the impression that the density of arable land increases very considerably westwards, while exactly the opposite impression is obtained from the modern map. The explanation appears to be that, in the latter half of last century, before the bulk import of overseas grain became possible, it was necessary to plough as much land as possible, and the clay soils were improved by means of drainage. The agricultural journals indicate this by the number of papers published on the subject, but land drainage at any time is a costly business, and the increase in agricultural wages, out of all proportion to any change in prices, has resulted in a smaller sum being available for such maintenance of drains as is essential, and hence they have gradually deteriorated and eventually become derelict. As a consequence, the land first became pasture and later on, in many instances, was allowed to revert either to poor quality grazing or even to woodland; a number of cases of the latter type of reversion are to be found in the region at present under discussion. The eastern part of these Weald Clay soils has been quoted as being the more sandy, and hence (as it needs less drainage) the relatively small change between 1875 and 1931. The small portion of Tunbridge Wells Sands occurring in this region, though bearing more arable land than in 1931, again appears as a relatively infertile area.

Turning to Map III (Tithe), the incomplete nature of the data, of which the dates of recording vary from parish to parish between 1837 and 1856, means that the picture is not quite complete, but the proportion of the area lacking records is relatively small, and is so distributed that there is no serious deficiency of information in any one of the regional units within the Adur Basin. As to the variation in dates, most of the parishes were surveyed by 1845, after which year only eight parishes had not settled their disputes; there were only two dated as late as 1851, and one 1856.

The actual distribution of arable land is shown to have been rather less dense than in 1875, but throughout the Basin it was far denser than at the present time. On the Coastal

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Plain, the smaller extent of the towns of Worthing and Brighton is apparent, as evidenced by the smaller area of non-arable land; the alluvium near the mouth of the river was under the plough, as it was down to 1875; and the plain again stands out as a zone with much more arable land than the Downland region to the north. On the Downs, the difference between 1875 and the Tithe map is very marked, and in general the southern half of the belt of Downland has a much greater proportion of its area under the plough than the northern portion. The ploughland spreads farther on to the Downs behind Brighton than elsewhere, and the concentration of arable land in the gaps and southward opening valleys is just as evident as at the other dates. In the zone of narrow geological outcrops at the foot of the Chalk scarp, the distribution is almost exactly similar to that on the 1875 map, with the exception that there is more arable land on the Gault on this map than at any other date. As on the other maps, there is a narrow belt of non-arable land along the southern edge of the Weald Clay, where the spring line along the junction of the Hythe Beds and the Weald Clay occurs; but, on the whole, there is a considerably greater area of arable land on this outcrop at this period than in 1875; the western portion of the Weald Clay soils stands out as being almost entirely under the plough. This degree of cultivation is the more surprising since, in addition to the clayey nature of the soil, this is the part of the zone which, then as now, is cursed with the "shaws" or tree-hedges to which all agricultural writers refer in such scathing terms. These shaws serve merely as hedges between fields, but are allowed to include trees of no mean size and are often anything between ten and twenty yards wide; the resultant lack of sunlight, both for plant growth and for evaporation of surface water, is so serious that it is normal to find, all round the field, a belt several yards wide in which crop yields are very poor.

During the latter half of the eighteenth century, as a result of the offer of a prize, a number of county maps was compiled on a fairly large scale, usually two inches to the mile, and one of these was that by two surveyors, Yeakell and Gardner, of Sussex. Their map of Sussex was to have been published in eight sheets, and was intended to record all land utilization details, as did those of John Rocque, who published similar maps of Surrey and Berkshire, and others; the Sussex map was never completed, and only the four

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southern sheets were published, while the information on these four is by no means complete, as far as the land utilization is concerned. It was found impossible to reconstruct the distribution of arable land for the Adur Basin at this date, therefore, and all that can be recorded, as shown on Map IV, is the land which Yeakell and Gardner have indicated as being other than arable. Even this is incomplete and consequently it is not safe to reason that the remaining land was actually ploughland.

On the Coastal Plain, the most striking feature is the lack of built-over land, e.g., Hove has only seven building symbols; secondly, it is seen that the area of alluvial soils near the mouth of the Adur was not arable in 1780, though it was under the plough both in 1875 and in the forties of last century; the very few and very small fields bearing a meadow symbol in the area to the west of Worthing suggests that this area, on the contrary, has always been of importance as arable land. On the Downs, there is little noticeable difference between this map and that of the Tithe period as far as buildings are concerned. The incomplete nature of the map is brought out, for several areas that do not bear a meadow symbol on this map have not been ploughed at any subsequent date; this supports the statement above, that it is not safe to assume that all land bearing no symbol must have been arable. The map covers only a portion of the Wealden zone, but it is valuable to note that the belt of Lower Chalk and Upper Greensand soils carries very little meadow, while the Gault is essentially meadow or woodland. The Lower Greensand soils bear relatively little meadow and the Weald Clay shows considerably less meadow than in 1931, though not a great deal more than on either of the other maps. Hence, on the whole, the information on Yeakell and Gardner is in keeping with the later and more complete records.

Conclusion. To summarize the evidence on the several maps, the Coastal Plain has been consistently arable at all dates, save for the alluvial soils, which were under the plough at two of the dates (1875 and Tithe), and for areas of normally fertile soils which have been steadily built over during the period under consideration. As to the Downs, it is evident that, at all dates, shelter has been the most important factor influencing the distribution of arable land, and that the

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existence of the gaps is of great importance on grounds of accessibility; a further general tendency on all the maps has been the apparent division of the Downland zone into two belts, a southern one with the bulk of the ploughland, and a northern one with very little ploughland and a considerable amount of hill pasture.

In the Weald, the most striking feature has been the consistently arable utilization of the several narrow belts of soils at the foot of the Chalk scarp, especially the Lower Chalk and the Hythe Bed soils, and the equally consistent absence of ploughland on the Gault soils. By contrast with the clays of Gault, the Weald Clay soils, though bearing little arable land in 1931, have at earlier dates been largely under the plough, chiefly as a result of careful drainage. The latter feature has been emphasized by the fact that the sandier portions, mainly towards the east, have shown less change than the essentially clayey areas in the west of the Adur Basin, where the geological term, clay, is borne out to the full.

It is generally realized that there has been a decline in the amount of land under the plough in most parts of the country. Further, it is accepted that the chief cause of such, is the development of large vessels capable of bulk transport of grain from the newer overseas producers; these producers, given the opportunity for extensive farming, have been able to market wheat, despite their distance from the market, at very low prices relative to the costs of production in this country of intensive agriculture. The net result is, that the more easily worked soils have remained under the plough while the heavier, but not necessarily less fertile soils, have reverted to pasture.

While the Gault Clays have apparently been too heavy for arable cultivation at all dates, the margin of profit was such, in the nineteenth century, as to allow the efficient drainage of clay soils such as those of the Weald. Labour costs have risen some 300 per cent. since the "seventies" of last century but there has been no corresponding increase in farmers' prices, and this has meant a reduction in the amount of money available for the maintenance of drainage systems. While Hall and Russell ("Soils of Kent, Surrey and Sussex," p. 125) claim that Weald Clay soils were never highly farmed, Hawes, in his paper on the Wealden Clay of Sussex (*J. Roy. Agri. Soc.*, Vol. 19, 1858, p. 182) writes: "The Wealden Clay is essentially a wheat soil, and produces handsome crops of it,

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healthy and strong, with bright straw and grain of a quality very superior to that grown on lighter lands; nor where the land is fairly dealt with, is there any deficiency in quantity." Again, in a footnote signed "H. S. Thompson" to an article by Prof. Buckman, entitled "Agricultural Weeds" (*J. Roy. Agri. Soc.*, Vol. XVI, 1856, p. 368) the following statement appears: "I have never yet seen clay thoroughly drained, deeply cultivated and reasonably well farmed, which did not speedily lose the name of *hungry*, and earn the title of *grateful*, clay."

The statistics of a Weald Clay parish (Twineham), obtained from the Ministry of Agriculture, show a decline in yield from 38 bushels to the acre in 1885 to an average figure of 31 bushels for the period 1930-1934. Hence it seems that the key to the decline in ploughed land on the Weald Clay lies in Hawes' explanation of his phrase "fairly dealt with," which he states implies good drainage and liberal manuring; the conclusion, therefore is, that the economic factor of an insufficient profit for the maintenance of drains is the crux of the change on this soil. In general, the whole problem revolves upon the low farmers' prices in recent years, though the factors through which individual cases are affected vary considerably.

While the present paper deals only with the Adur Basin, and, as has been stated, the records are by no means complete for the whole country, this is not the only area being worked upon. The writer has himself already done a considerable amount of the work for a similar study in Derbyshire, and several of his post-graduate students are extending the work in Sussex and southern Surrey, Devonshire, Essex, Hertfordshire, Leicestershire and Wiltshire. The writer hopes that eventually he will have a sufficiently large number of students to map and interpret all the available records. The resultant maps will be reduced to the common scale of one inch to the mile, though the originals can bear photographic reduction to a scale of one-quarter inch to the mile, as is seen with the accompanying illustrations, all of which are approximately on that scale.

Even in its present incomplete state, the carrying out of this work has made heavy demands upon the time and patience of the officials in charge of the relevant documents and maps, both at the Ministry and at the British Museum, and to these the writer wishes to offer his grateful thanks.

HERBS IN THE KITCHEN

AMBROSE HEATH

I HAVE been asked to write a few notes about the uses of herbs in the kitchen, basing them on the Ministry's Bulletin No. 76 on Herbs,* published a short time ago. For many years, the cultivation of herbs for cookery had fallen into general disuse, except for the flavouring of stuffings and in those national sauces, like mint sauce and parsley sauce, which, with onion sauce, have been declared to be our only efforts in this direction. Most people were satisfied (and still are, I fear) with a packet or bottle of "mixed herbs"; and, provided they had a strong enough flavour to make themselves obvious, little attempt was made to differentiate between the various ingredients. It was unusual to find, in a kitchen garden, much more than a few clumps of parsley, mint and sage; and, as a well-known writer on food has complained, the parsley would have been better employed in the dish than garnishing it outside. The greater interest that has been taken in food and in cookery during the past few years, has brought about a change, and I believe that people are now more interested in herbs than ever before. Although this interest has arisen out of cooking, a great many people are still ignorant of the particular uses of the various herbs. I would like, therefore, to give some idea here, with a few recipes, of ways in which different herbs can be used in the kitchen; and, for a rough-and-ready method of assembling my notes, I will take the order in which these herbs are dealt with in the Bulletin. I ought, perhaps, to add that while Continental nations have always treated herbs with greater respect and discrimination than we have, sweet herbs were of course very largely, and often indiscriminately, used in our kitchens in past centuries. Whether this was because the popular palate was less refined than it is nowadays, or, as has often been suggested, in order to disguise the inferior quality of the meat or fish, I cannot say; but the fact remains that not only was the "bunch of sweet herbs" fairly omnipresent, but a great many herbs and seasonings were employed in cooking which would not be tolerated nowadays.

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2, price 1s., post free, 1s. 2d.

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Parsley. While seedsmen have concentrated their efforts on producing a beautiful curled plant for decoration, oddly enough the principal use to which this herb can be put demands the stalk rather than the leaf. I mean the *Bouquet garni*, so much and so admirably used in French cooking for flavouring stock and various sauces. This bouquet (the classic bunch of sweet herbs, perhaps) which Escoffier rather bluntly and far less picturesquely calls a "faggot," consists of two or three parsley stalks, a sprig of thyme, and a bayleaf tied together. (If any of the constituents are dried, then the bouquet is enclosed in a little piece of butter muslin, the aim in either instance being that it can be taken out of the stock, etc., when necessary.) The bouquet is invariably put into stock at the same time as the vegetables, and accounts for a good deal of the savouriness of French soups and sauces. It is a practice highly to be recommended, and an increasing number of English cooks make use of this delicious addition, the presence of which is really a hall-mark of good cooking. The other principal uses of parsley are for making parsley sauce, fried parsley and the usual veal forcemeat familiar to us all, also in maître d'hôtel butter, which consists of butter pounded up with very finely chopped parsley and a touch of lemon juice. This is used as a garnish for certain fried or grilled fish and with grilled meats.

Mint. Mint sauce has already been mentioned. English people are usually fond of vinegar, otherwise they would prefer mint jelly, which is really apple jelly flavoured with mint, mint leaves being infused in the apple juice before the sugar is added. In some French dishes, mint is included in the mixed herbs, but not in many. Its most famous use after mint sauce, is in the American Mint Julep, one of the recipes for which is as follows :

Add the leaves from a bunch of fresh mint to a cupful of lemon juice and half a cupful of water, and stir in a cupful and a half of castor sugar. Leave for half an hour. Put a large piece of ice in a jug or bowl and pour this infusion over it, adding three pints of ginger ale. A good drink for hot weather.

Sage. This very strong herb is, of course, best known in sage and onion stuffing, which it usually dominates to the exclusion of even the flavour of the meat it stuffs. I have found, however, that there is a faint affinity between dressed crab and sage, provided that the latter is used in infinitesimal quantities.

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Tarragon. Tarragon is one of the most delicate and delicious of all the herbs, and it is a pity that it is not better known; it is often difficult to obtain it fresh. Tarragon vinegar is fairly popular among those who exercise discrimination in salad dressing, and is quite easy to make at home. All that is necessary is to steep some fresh tarragon leaves in white wine vinegar (a teacupful to a quart of vinegar) in a closed jar for six weeks, and then to strain off and bottle the impregnated liquid. Tarragon has a perfect affinity with chicken, and to a lesser degree with rabbit, the addition of a few leaves to either, when boiled, making a great difference. When roasted, a chicken will be vastly improved in flavour if its own liver, chopped up with some tarragon leaves and then pounded with a good piece of butter, is placed inside the bird before it goes to the oven. The principal use of tarragon, however, is in the mixture that the French call *fines herbes*, which is used so extensively in their cooking and in dressing salads. This consists of the four herbs, tarragon, parsley, chives and chervil, in equal parts, very finely chopped and carefully mixed together. A salad of plain lettuce without this charming addition is like a salmon mayonnaise without the mayonnaise! The *fines herbes* should be sprinkled lightly over the salad before it is dressed, but they should not be mixed with the dressing, as their principal charm lies in their freshness, which would be lost if they were soaked in the vinegar. *Fines herbes* are excellent when mixed with mashed potato.

Horseradish. This is seldom used in this country save scraped or in a sauce, with beef. In Sweden a purée of apples cooked with a little white wine, into which is stirred some grated horseradish, is popular with certain meat dishes, and a mayonnaise is flavoured in the same way.

Thyme. This has already been mentioned in the parsley paragraph as being one of the components of the *bouquet garni*. Apart from its further use for stuffings, there are possibilities in the use of the specially-flavoured thymes, such as Lemon Thyme, in custards and creams, the leaves being infused in the milk before the custard is made.

Fennel. This herb was at one time used in England for a fish sauce as commonly as parsley is now, chopped blanched fennel leaves being added to a white sauce in the same way

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as parsley, with which it was sometimes combined. A simpler fennel sauce needs merely the addition of the chopped blanched leaves to melted butter, and this will be found to be excellent with mackerel and, according to many, also with salmon. The fennel that many of us have eaten on the Continent is Florence Fennel, which is earthed up like celery. The heads are left to soak, after they have been trimmed, in salt water for half an hour and can then be boiled or braised in the same way as celery. When cooked they may also be dressed with cheese and served *au gratin*.

Sorrel. The principal uses of sorrel are as a vegetable rather than a herb, although its astringent leaves give a pleasant taste to a salad. With certain dishes of white meat, or those with which spinach goes particularly well, sorrel can be used as a purée, being cooked in the same way as spinach.

Pick as young as possible, and, if necessary, strip off the stalks. Wash them in several waters, and drain well, then boil them gently in water for five minutes. A scant half-pint of water would be enough for a pound of the leaves (which will be enough for two people), and it is wiser to stir the leaves with a wooden spoon as they boil, for they easily stick to the sides of the pan. After five minutes' boiling, turn the leaves into a colander, and let them drain well again. Now chop them finely on a board, and put them back into the pan in which you have mixed a spoonful of flour with the same quantity of melted butter. Then pour in about a cofeecupful of white stock, and simmer for about an hour with the lid on the pan, stirring occasionally. If desired, one can bind this purée with a yolk of egg beaten up in a little cream. Sorrell Soup is particularly good, too, and the well-known Potage Santé is really only leek and potato soup garnished with thin strips of sorrel.

Borage. This is a pretty enough herb, but I doubt if it has any serious kitchen use. Its leaves and flowers look very handsome in a white wine cup, but nowadays the stronger flavour of cucumber peel itself is preferred.

Chervil. This delicate little plant is, as already indicated, one of the ingredients of *fines herbes*. It goes well with chicken and with eggs, and the fine little leaves are greatly used in garnishing cold jellied dishes, meat, fish and eggs, to which they also impart its charming but fugitive flavour. The smallest pieces of the leaves, known as *pluches* in culinary language, are used for garnishing soups.

Marjoram. This herb has a flavour which many prefer to thyme, and is therefore often used to supplant the latter in stuffings or in the *bouquet garni*. A sprinkling over a joint

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of roast pork is vastly preferable to sage, which is sometimes recommended for use in this way.

Savory. This attractive-looking and pleasantly smelling herb, reminiscent a little of sage without its coarseness of flavour, is used in France to cook with broad beans and also with peas. We Britons are too wedded to our love of plainly-cooked green peas to like this fashion; but those who like peas cooked *à la française* should try it. With broad beans, it is wholly to be commended, but it must be remembered that the beans should be cooked without their skins:

Shell the beans and put them into boiling water and let them boil for a few minutes. Take them out and they will easily slip out of the skins. Now put them into a saucepan containing just enough water to cover them, add a few sprigs of savory, salt, of course, and cook them gently until they are tender. Drain the water off, dry the beans quickly over the fire, add a piece of butter, roll the beans in it carefully so as not to break them, and serve them. One may add a very little finely-chopped savory leaves afterwards, if the flavour is much liked, but these would have to be blanched first or they would be too strong.

Basil. This is a herb that is sadly neglected. It is used principally in the making of turtle soup, also mock turtle soup, when its flavour is easily recognized. Its principal virtue, however, lies in its marvellous affinity for tomatoes, and I would go so far as to say that no tomato soup or sauce should be made without at any rate a touch of basil in it. It should certainly be tried in forcemeats.

Rosemary. I have taken this out of another section of the Bulletin because there is a dish in which it is used that is so good that it ought to be better known. The strong leaves of this plant are used in Italy for flavouring a ragout of veal, but in Germany they are used mainly in the following dish of hare, or, better still, leveret:

For it, you want the whole of the back of the leveret, which the French call the *râble* and is really the whole of the back from the neck to the hind legs. Skin it down to the flesh and put some pieces of fat bacon over the top. Now roast this on a bed of chopped onions and carrots with a *bouquet garni* of thyme, parsley, bayleaf and a sprig of rosemary in the middle. When it is nearly done, take off the bacon to let the back brown, and when it is done, take out the vegetables and the bouquet and pour into the pan a cupful of cream. Stir this well with the juices left in the pan, and let it boil up ; add a touch of lemon juice and pour it over the leveret.

Coriander. This and Dill I have taken from another section of the Bulletin, as, in some parts of Europe, they are

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used in the kitchen. Coriander, which has an orangey flavour, is used in cakes and biscuits as well as to flavour custards.

Dill. The seeds of this herb are sometimes used for flavouring vinegar, in which it is steeped for a few days before the vinegar is wanted. It has, however, lost the popularity it enjoyed two hundred or so years ago. Its leaves are used in Scandinavia in flavouring sauces for meat. It is also used largely in Germany in the pickling of cucumbers, as it was at one time in this country.

Caraway. I should have added Caraway, as the seeds of this herb are used in Hungary in the well-known *Goulash*, a stew of meat, onions, potatoes and paprika pepper. As this is a dish worth trying, I give it here:

Cut three medium-sized onions in thin slices, and brown them in a pan in a little lard with about $1\frac{1}{2}$ lb. of beef cut in two-inch squares. Add a little salt, a teaspoonful of caraway seeds in a muslin bag, one or two teaspoonfuls of paprika pepper, three or four peeled and chopped tomatoes and half a cupful of water. Cover and cook for an hour and a half to two hours, then add a cupful of water and seven or eight smallish peeled potatoes. Cover again and cook for another hour, when the potatoes should be done but still whole. Then serve very hot.

Chives.* Though chives are not mentioned in the *Herbs Bulletin*, they have been referred to as one of the *fines herbes*. They are really a very small onion, quite easy to grow and best propagated, I have found, by division. The tiny bulbs are used by some for pickling, but the real value of the plant lies in the grassy leaves which it throws up in great profusion. As it possesses a pretty mauve flower, rather like thrift, it makes a useful border plant for the kitchen or herb garden. As I have said, the leaves are one of the ingredients of *fines herbes*, but they are very good if used by themselves, finely chopped, especially with mashed potatoes, with potato salad (instead of onion), and in omelettes. Those who like a flavoured cream cheese can make an excellent one by beating up some of the chopped leaves with one, or some chopped *fines herbes*, if chives alone have too oniony a flavour.

Bay. This, of course, is not a herb, but it has been mentioned in the *bouquet garni*. The only comment I wish to make here is that, in a great many carelessly translated cookery

* Chives are dealt with in the Ministry's Bulletin No. 69, *Onions and Related Crops*. Obtainable from H.M. Stationery Office. Price 1s., post free, 1s. 2d.

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books, the French for Bay (*laurier*) has been given as Laurel. It would hardly be pleasant to include a laurel leaf in your *bouquet garni*, so if any of my readers come across this far too common mistake they will be on their guard. Bayleaves, by the way, have an affinity in flavour with cauliflower, as will be discovered if, when next a cauliflower soup is made, a bayleaf is added or infused in the milk.

Conclusion. I have touched here on a number of uses for various herbs in the kitchen, and, on looking through what I have written, I can see how slight my knowledge is. In most European countries, there are recipes depending almost entirely on certain herbs for their flavour, but it would take a lifetime to make an exhaustive study of them. In Switzerland, for instance, thyme is used for flavouring a certain cheese; in the south of France, fennel is more widely employed than elsewhere; in Brittany, mint is added to the *bouquet garni* in a certain fish soup; while, in America, sage, I believe, is put to more uses than could be thought possible. Perhaps after a few more years' experience in the art and practice of cooking, I may be able to return to this entrancing subject. Meanwhile, like Candide, I must "*cultiver mon jardin.*"

AUSTRALIAN SHEEPYARDS AND SHEARING SHEDS

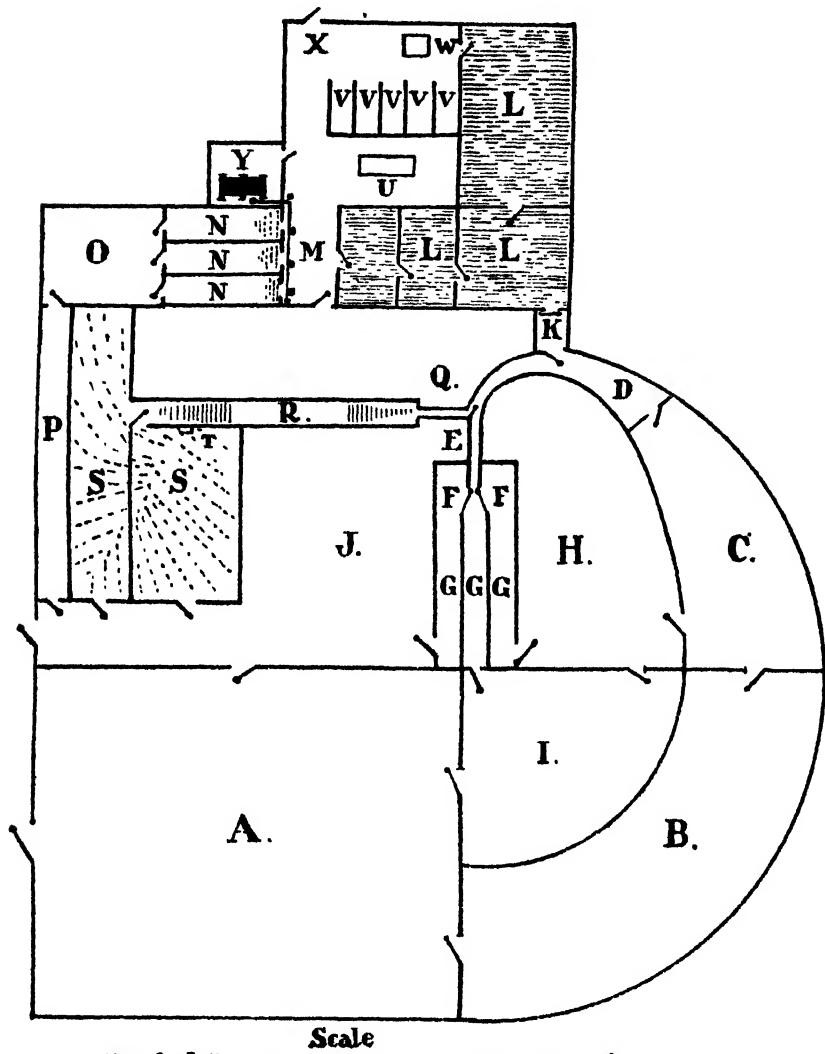
GEORGE BERRIE

AUSTRALIA depastures over one hundred million merino sheep, pre-eminent in the world's production of fine wool. There are stations where upwards of a hundred thousand head are managed as one flock, but run in separate sections according to age and sex. Stud rams have been sold in Sydney for as high a figure as five thousand guineas. It follows that during many years of scientific flock-building the problems of efficient handling have not been neglected, and the object of this article is to illustrate the Australian system of drafting yards, shearing sheds and dipping baths, in the hope that they may prove of practical interest to the British sheepbreeder, either large or small. The diagram accompanying shows a combination of all three, which makes for economy in construction, and labour saving in actual use. The plans of both yards and bath are now generally accepted as a standard in Australia. Shearing-shed designs vary considerably according to numbers, but, for small flock-owners, the one here illustrated will be found satisfactory. The writer has actually built the complete outfit as shown, managed sheep stations both large and small, and had years of experience in charge of machine-shearing operations on a large scale; he knows the advantage of a carefully planned outfit to the sheep and to the men who handle them. He does not wish this article, however, to be regarded as an attempt to teach the British sheep-farmer his job.

Some very pleasant weeks spent, this summer, in one of the leading sheep counties in Britain failed to reveal anything effective in the way of either yards, shed or dip. Yet in every other respect, in the housing and feeding of pigs, cattle and sheep, in manuring, crop rotation and scientific cultivation, the methods were well thought out, buildings carefully planned, and the work thoroughly effective. The care taken of the sheep by their shepherds was almost minute. The writer has never seen more conscientious or intelligent stock-hands than those shepherds, and they certainly deserve better facilities.

On all well-managed Australian sheep stations the wool clip is prepared for auction in the shearing shed. It is not

AUSTRALIAN SHEEPYARDS AND SHEARING SHEDS



PLAN OF AN AUSTRALIAN SHEEPYARD AND SHEARING SHED.

- | | |
|---|---|
| A. Main Receiving Yard. | O. Exit yard for sheared sheep. |
| B., C., D. Driving yards | P. Branding race. |
| E. Drafting race. | Q. Gate; shutting off dipping channel. |
| F. Drafting gates. | R. Dipping bath. |
| G. Check or observation pens. | S. Draining pens, with floors sloping to T. |
| H., I., J. Yards for sheep awaiting shearing. | T. Pipe carrying drainings back to bath. |
| K. Ramp up to shearing shed. | U. Table for fleeces. |
| L. Pens for sheep awaiting shearing. | V. Wool bins. |
| M. Shearing floor. | W. Woolpress. |
| N. Sloping pens for exit of sheared sheep. | X. Bag or bale space. |
| | Y. Engine shed. |

AUSTRALIAN SHEEPYARDS AND SHEARING SHEDS

suggested that anything so elaborate as the Australian system is either necessary or desirable here. On one farm which the writer visited, the wool from Oxford and Suffolk crosses was kept separate, and dags and stained wool were removed from the fleeces. Had patches of heavy, sandy wool been ripped out and some badly matted fleeces kept apart, it is certain that the sale of that clip would have been improved. The shepherd who was shearing could easily have done all that was necessary, especially if he had been given a table to work on instead of the floor.

In the appended plan, the scale of the yards is designed for working a thousand sheep and the shed to accommodate three shearers. Either can be reduced or increased in capacity. The dipping bath is a standard which it is not advisable to vary, the length of the swim being calculated to give sufficient time for immersion. A co-operative bath erected in a central position might be a practical proposition in some localities. The flocks of half-a-dozen average-size farms could be dipped comfortably in a forenoon.

In order to explain the working of the plan, we may begin by bringing in a flock for shearing into the main receiving yard (A), which will hold a thousand sheep comfortably. Thence they are driven round the semi-circle through yards B, C and D to the drafting race at E. For merinos, the race is usually fourteen inches in width and twelve feet in length, for British breeds it would probably need to be both wider and longer. Opposite the end of the race there are three long check, or observation pens about five feet in width (G), and the two drafting gates (F) hang on the end posts of the centre pen. When drafted into these pens, the sheep can be easily examined for mistakes made by the drafter. If no examination is necessary, the gates can be left open, and the sheep pass into yards H, I and J; H being used for the portion of the flock to be shorn first. It is then taken through yards C and D, to where a ramp at K leads up into the shearing shed, usually built from two to three feet from the ground. At the entrance to K, a gate in the fence allows access from yard D by swinging across to the opposite fence and shutting off the approach to the race (E).

The shaded portions of the building (marked L) accommodate woolly sheep, and the floor space is of grating. Hardwood battens are used, an inch and a half in width, and an inch in depth, and they are placed three-quarters of an inch

AUSTRALIAN SHEEPYARDS AND SHEARING SHEDS

apart, allowing excreta to fall or to be trampled through. The shearing floor is at M, and each of the three shearers works opposite one of the long pens (N), which are outside the building. There is an opening into each pen through the wall, and a chute from the floor to the ground to allow the sheep an easy passage outwards. The number of sheep shorn by each man can be checked and faulty work noticed, a very necessary provision in Australia where all shearing is piece-work. Yard O holds the sheep when let out of the counting-out pens (N). Thence they pass through the branding race (P), and finally back to their fields.

In the shearing shed, if machines are used and they are of the belt-driven variety, they are erected on the wall above the chutes leading to the counting-out pens (N), and the shearers catch their sheep from the pen opposite them across the shearing floor (M). Y is a small room outside the main building and accommodates the engine, grinder and a working bench. If a portable shearing plant is used, it is placed in the most convenient position on the floor (M), but in point of efficiency it does not compare with a belt-driven overhead outfit. As the fleeces are shorn they are thrown on to the wool-table (U), skirted, rolled, and placed in the woolbins (V), according to classification. Opposite these bins, a woolpress stands at W, and the bales or bags are stacked in the remaining space marked X. The divisions inside the building are usually merely made sheep-proof, and the bins hold the equivalent of a bale of wool when unpressed. Skylights and windows are built in as required for light and ventilation. The space under the shed, as well as in it, is found very useful in case of a risky weather change during shearing.

In the working of the dipping bath, the sheep are brought round to the small forcing yard (D) as if for drafting, but at the race marked Q there is a narrow gate let into the fence which shuts the entrance into this race when drafting. This gate, on being opened, swings inwards across the entrance to drafting race (E), closing it and leaving race Q open. The sheep are forced along this race to the dipping bath (R), which is fifty feet in length over all, five feet in depth, two feet in width at the top and one at the bottom. At the entrance end there is a steep slide into the water, at the other, an easy gradient where the sheep walk out into the draining pens (S). The floors of these pens are given a gradual slope to point T where an underground delivery pipe

AUSTRALIAN SHEEPYARDS AND SHEARING SHEDS

capped by a strainer carries the drained liquid back into the bath. The sheep are ducked twice while swimming.

As illustrating the labour-saving efficiency of the sheep-yards, the writer once saw sixteen thousand sheep drafted in one working day by five men : the yards, of course, were on a much larger scale than in the plan accompanying this article. To put seven hundred sheep through this walk-in, walk-out dipping bath is a comfortable hour's work. For dagging, drenching, foottrotting or *any* sheep work, the shearing shed is just as useful as it is for shearing. It is certain that no up-to-date British sheep-farmer would be without yards, shed, or dip of this plan, once he knew the comfort of working in them. To anyone interested, the writer will be only too glad to supply any further details required.

HEREFORDSHIRE ORCHARDS : "A PATTERN FOR ALL ENGLAND" IN 1657

G. E. FUSSELL,
Ministry of Agriculture and Fisheries.

MODESTY as a virtue must be a modern idea. The more early books on branches of farming I read, the more I become convinced that these writers did not believe in it, and I can find little evidence that others of their contemporaries believed in it either. John Beale, who wrote a book about "Herefordshire Orchards" in 1657, is no exception. The book was addressed to Samuel Hartlib, who was at about that date responsible for issuing a good many books on farming: and Beale had the greatest admiration for Hartlib as well as for himself and for Herefordshire. He calls Hartlib "The zealous Sollicitor of Christian peace Amongst all Nations; the constant Friend of distressed Strangers; the true hearted lover of our Native Countrey; the sedulous advancer of Ingenious Arts and Profitable Sciences, and the Principall Contriver of Generall Accommodations." It is rather a pity there was no more space on the page of the "address"! Hartlib, however, heartily returned Beale's admiration, not without just cause, "as a man to do good," because Beale praises his publications, saying, "in my rural retirement I have received some profit and very much innocent and refreshing delights in the perusal of those treatises, which are by your diligent hand communicated to the public."

Of himself, Beale reports in his book: "My education was amongst Schollars in Academyes, where I spent many years in conversing with vanity of books only. A little before our wars began, I spent two summers in travelling towards the South, with purpose to learn to know men and foreign manners. Since my return I have constantly been employed in a weighty office . . ." He carried out a request of Hartlib, and in his book "gives some plain and unpolished account of our *Agriculture in Herefordshire*."

In fact Beale was descended from a good family of Herefordshire. He was born in 1603, educated at Worcester and Eton, went to King's College, Cambridge, in 1629, graduated B.A. in 1632, M.A. in 1636, and was made a D.D.

HEREFORDSHIRE ORCHARDS IN 1657

His modesty is again evident in the emphasis he lays upon his industry while engaged upon his studies. He did his utmost to cultivate a retentive memory, learning large parts of books by heart, so much so that according to his own account he became something of a prodigy and was able to read books on booksellers' stalls and remember their contents.

Besides his correspondence with Hartlib, he was often in communication with the Hon. Robert Boyle, and other distinguished people. In 1660 he became Rector of Yeovil, where he spent the rest of his life. He was also rector of Sock Dennis and was an early member of the Royal Society. In 1665 he became Chaplain to Charles II. His achievements do something to justify his good opinion of himself.

Naturally such a man was a local patriot, and he cannot find anything too good to say about the farming of his native county. Here again he had a large measure of justice, because Hereford and Worcester were early recognized as examples of the advanced farming of the day.

The gentry of Hereford were, Beale tells us, " very careful in setting forward such kind of husbandry as best agrees with the nature of the soil where he inhabiteth. From the greatest person to the poorest cottager, all habitations are encompassed with Orchards and Gardens, and in most places our hedges are inriched with rowes of fruit trees, pears or apples, Gennet-moyles or crab-trees."

The pears were used for making a " weak drink for our hindes." It was refused by the gentry " as breeding wind in the stomach " but " is most pleasing to the female palat, having a relish of weak wine mixed with sugar." One of the pears was the White Horse pear, and Bosbury was famous for a peculiar perry. The Barcland pear made good perry, but was too hard and coarse to bite.

A rough distribution of the types is given. Gennet-moyles and hedge-pears grew in the worst soils, near Irchinfield or towards Wales. They were nice fruit but on such soils the crop might be expected to fail every other year. The Gennet-moyle was the best cider fruit. Indeed Beale preferred it to the famous Red-streak. It also was good for " pyes and tarts." The crab apple was commonly ground for verjuice, but the Bromsbury-crab, " a fresh wonder, lately found out," makes one of the best ciders. Pippins were also used for cider. In spring, of course, the multitude of fruit trees

HEREFORDSHIRE ORCHARDS IN 1657

"much ornamented the countryside," as they still do to-day. Moreover, in Beale's opinion the orchards "purifie the ambient air."

Cider was the universal drink. "Few cottages," says Beale, "yea, very few of our wealthiest yeomen, do taste any other drink in the family, except at some speciall festivalls, twice or thrice in the year, and that for vanity, rather than choice." The same blessings were enjoyed "in our borderers of Shropshire, Worcestershire and Gloucestershire." Cider was, of course, also made in Somerset, and much more, so Beale says, in Kent and Essex.

He makes some attempt to classify the districts by soils. Bromyard had a cold air and a shallow, barren soil. "About Ross and Webley, and towards the *Hay*, a shallow, hot, sandy or stony rye land and expos'd to a changeable air from the disgusts of the black mountain; yet here and all over *Irchinfield*, and also about *Lemster* both towards *Keinton* and towards *Fayremile* in all these barren provinces," there were as good orchards as in "the Richest Vale . . . even by Frome banks." Beale considered that Worcester was more suitable for pears and cherries, while Hereford excelled in apples.

The root of the pear tree is more piercing and clays suit it: the best cider and eating apples grow in shallower soils, less commended for other uses, and preferably on high ground or highland. "What Columella says of Vines," he add, "I may as truly say of Fruit trees." In addition to Columella, Beale had also studied a book, almost contemporary, on orchards written by William Lawson in 1638. Lawson was a North country man, and there was much in the book so strange to Beale that he laughed at it, as did many of his friends. After trying out Lawson's directions in practical experiments, however, he found the system a good one, even though he did not find it practised locally; and he adds a warning to all experimenters which is just as valid to-day: "Trust not one yeares triall."

"One reason," he adds, "why fruit do so abound in this County, is, for that no man hath of late years built him a house, but with speciall regard for the proximity of some ground fit for an Orchard." Even the servants built their cottages on suitable land. The choice of a site was with a slope towards the south, on a soil of some depth, but not too friable.

HEREFORDSHIRE ORCHARDS IN 1657

Beale envisaged the day when Hereford should become a great market-garden county, but he mournfully says, " For Gardens we have little encouragement to designe more than is for the necessary use of our own families, except our River Wye be made navigable for transportation." Road transport was of course so slow because of the heavy waggons used, and so difficult because many of the so-called roads, mere dirt tracks, were impassable or almost so. These difficulties no longer exist, of course, and his prophecy has come true.

The humble conclusion is that " We are generally noted to excel in all kinds of husbandry: our ploughs are light, but we listen after further directions which come to us through your hands. The rye of *Clehanger* and some parts of *Irchinfield* is as good as the Muncorne or Miscellane of many other Countreys; and our wheat is upon the ground farre richer than I saw any in the fair vale of *Esome* in *Worcestershire* and *Warwickshire*.

" For pastures we add improvements daily and as a stranger passeth by our habitations, by our fences, orchards, pastures, arable, he may distinguish a well-ordered house-keeper and a freeholder, from an over-wracked Tenant and an unthrift."

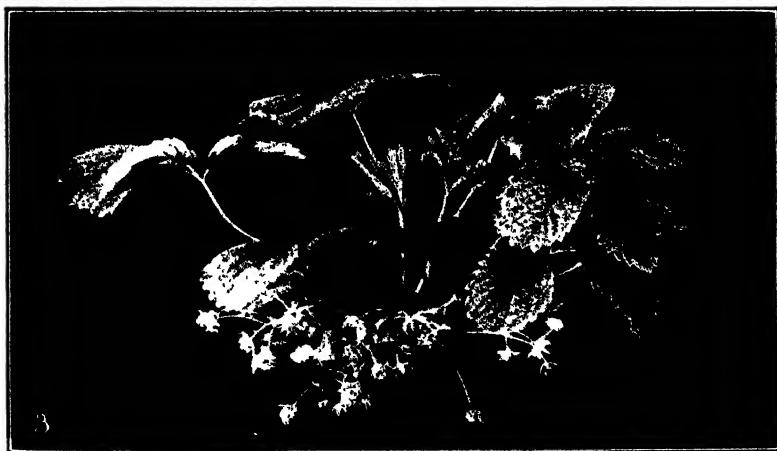
THE INTERPLANTING OF OBERSCHLESIEN AND TARDIVE DE LEOPOLD STRAWBERRIES WITH POLLINATOR VARIETIES

THOMAS SWARBRICK, M.Sc., Ph.D.,
Long Ashton Research Station.

THE period following the Great War is notable in the annals of strawberry growing in Great Britain for the widespread and serious decline that overtook all the then recognized commercial varieties, also for the introduction into this country of numerous varieties from the Continent. Of the latter, two varieties quickly established themselves in commercial cultivation—Oberschlesien and Tardive de Leopold. It is freely admitted that when first introduced, and for some time afterwards, these two sorts contained a greater or less admixture of rogues, but, notwithstanding this variety mixture, cropping and growth were both satisfactory. Through the introduction of the Ministry's certification scheme for strawberries, these two varieties were established true to name and free from rogues. Subsequently, large-scale plantings of pure stocks were made for runner production and fruiting, particularly in the Vale of Evesham.

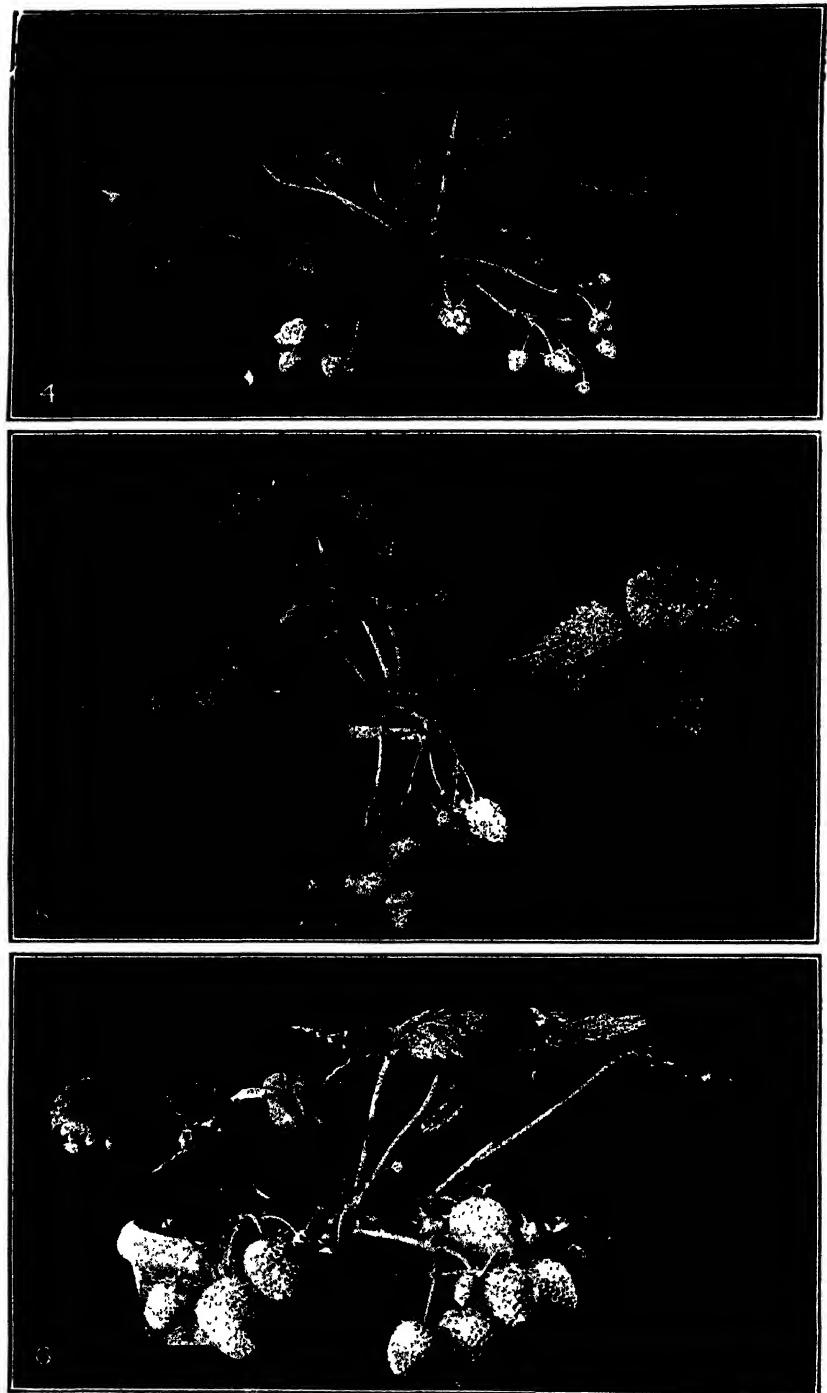
The variety Tardive de Leopold was recognized as self-sterile almost from its introduction, and, since it does not produce any pollen, the necessity for interplanting it with a pollinator variety was evident. Previous to the establishment of pure stocks of both Tardive de Leopold and Oberschlesien, the rogue plants provided the necessary cross-pollination, but subsequently a definite interplanting system became necessary. Since the variety Oberschlesien was in favour and was possessed by the grower, it was not surprising that it was used on a large scale as the interplant for Tardive de Leopold. In fact, from 1928 to 1930 or 1931, large plantings of these two varieties were made in the Bristol Province.

By 1930, it was found that this planting scheme was not satisfactory, because the cropping of both varieties had fallen to a very low ebb, in spite of vigorous growth and copious blossoming. Further, both varieties were producing a large proportion of malformed or "hard-ended" berries. Indeed, this latter condition became so common that it was



Photos Dr. Scarbrick

1 Tardive de Leopold pollinated with Royal Sovereign, and 2 Tardive de Leopold pollinated with Huxley note in each, complete set of well-shaped fruits. 3 Tardive de Leopold pollinated with Oberschlesien note partial set and the malformed fruits



Photos Dr. Swarbrick

4. Oberschlesien self-pollinated : note the malformed fruits 5. Oberschlesien pollinated with Royal Sovereign 6. Oberschlesien pollinated with Huxley Note in 5 and 6 complete set of well shaped fruits.

INTERPLANTING STRAWBERRIES FOR CROSS-POLLINATION

regarded as a characteristic of Oberschlesien, and was a serious defect, particularly from the canner's point of view.

The matter was brought to a head in the same year by the writer being called upon to investigate two cases of the non-cropping of Tardive de Leopold on large-scale holdings. In both instances, it was established beyond any doubt that the plants were healthy and had blossomed freely: disease was obviously not the main cause of the falling away of the crop. In both cases, Oberschlesien had been used as the interplant, and the lack of necessary cross-pollination was suspected as the main cause of the crop failure. Experiments to determine this point were initiated at Long Ashton and the present report sets out the application of the results of this work to the problems of commercial production.

The primary object of the experiments carried out at Long Ashton from 1930 to 1935 was to determine, within the limits of commercial possibility, the best pollinator varieties for Tardive de Leopold. The three sorts, Royal Sovereign, Oberschlesien and Huxley were used as a source of pollen for the flowers of Tardive de Leopold, and repeated experiments showed that, while both Royal Sovereign and Huxley invariably gave a good "set" of fruits the pollen from Oberschlesien gave rise to an indifferent crop of partially malformed and "hard-ended" fruits. The difference was most noticeable, and is illustrated in Figs. 1, 2 and 3, which show plants of Tardive de Leopold pollinated respectively with Royal Sovereign, Huxley and Oberschlesien. The crop failure of Tardive when interplanted with Oberschlesien was clearly due to the inability of the Oberschlesien to provide adequate cross-pollination.

The work was then expanded to discover, if possible, the reason for the failure of Oberschlesien to provide adequate cross-pollination of the Tardive flowers. It was found that Oberschlesien was itself partially self-sterile, and that even when it was pollinated daily with its own pollen it produced an indifferent crop of fruit, many of which were slightly malformed. This condition is illustrated in Fig. 4. Pollen germination tests showed that although Oberschlesien produces plenty of pollen, much of it fails to germinate even under ideal conditions, and that in any event germination is slow and the resulting germ-tubes are short. The difference between Oberschlesien and Royal Sovereign is shown by the fact that whereas, under similar conditions, 90 per cent. of

INTERPLANTING STRAWBERRIES FOR CROSS-POLLINATION

the Royal Sovereign pollen germinated in 7-10 hours, only 30 per cent. of the Oberschlesien pollen germinated in 24-36 hours.

Since Oberschlesien proved to be partially self-sterile, the work was still further expanded in order to determine satisfactory pollinators for this variety. Royal Sovereign and Huxley have both proved suitable. Photographs of typical plants of Oberschlesien pollinated respectively with Royal Sovereign and Huxley are shown in Figs. 5 and 6.

General Recommendations. Experience throughout the strawberry-growing areas of the country shows that both Oberschlesien and Tardive de Leopold do not now yield the heavy crops that were obtained during the years immediately following their introduction, and are, in fact, falling in popularity. In many cases vigour and blossoming are still satisfactory. Sufficient attention, however, is not given to their needs in the matter of cross-pollination. Experiments have shown that Oberschlesien is not a satisfactory interplant for Tardive de Leopold. Further, Oberschlesien, being itself partially self-sterile, should not be planted as a single variety, but provision should be made for its cross-pollination. Royal Sovereign and Huxley have each proved satisfactory as interplants for both Tardive de Leopold and Oberschlesien. While controlled experiments have not been carried out at Long Ashton, it has been reported to the writer that Madame Lefevre is also satisfactory as a pollinator for Tardive de Leopold.

It is essential that only good stocks of plants be used, otherwise the interplant may die out, thus leaving the main variety still unpollinated. Experiments in the field suggest that a better result is obtained by having four or five rows of pollinator and pollinated varieties. The variety to be pollinated should be flanked on both sides by a pollinator.

A PHYSICAL TEST FOR LING HONEY

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THE judging of honey at shows is an art that requires considerable experience and is always open to a certain amount of criticism. No two judges are certain to give the same awards. The same judge may make different decisions on different occasions. Even when using the score card system, it cannot be said that the merits of different honeys can be numerically expressed. In other words, so-called "organoleptic tests" are uncertain, and it is impossible to convey with any accuracy the grounds on which honeys of a series under consideration are placed in a given order.

Tea and wine tasters are, no doubt, of great assistance to the firms that employ their services, but the excise department and the analyst require specific gravity tests and chemical reactions that do not depend on a man's opinion. Definite data are being obtained, on which such commodities as malting barley and flour, can be evaluated on grounds more convincing and reliable than the pronouncements of an expert, however long his experience may have been.

It seems desirable that attempts should be made to express the quality of honey similarly in terms of analysis or physical properties that may be determined precisely, by means of tests that are capable of repetition, and as far as possible to exclude the personal factor of judgment, however skilled. The inclusion of honey in the National Mark scheme meant that honey so packed had to conform to certain standards of clarity, colour, water content (conversely, total solids) and sucrose (cane sugar) content. A limit was placed on the percentage of water allowed, on the grounds that fermentation is apt to occur if it exceeds a certain amount. This was fixed on the safe side, as sales of honey are much injured if honey that is fermented or otherwise below standard is offered for sale.

The amount of water present may be determined from the density of the honey. There has been much confusion among beekeepers in the past over the term density: it has often been treated as synonymous with viscosity.

Density or specific gravity can be measured by weighing

A PHYSICAL TEST FOR LING HONEY

a sample of known volume, or by the use of a hydrometer which floats high or low according to the density of the honey or other liquid. The hydrometer is a familiar method of testing the acid in an accumulator. The specific gravity bead, which is recommended for the use of honey packers, works on this principle. This is the commonest way of arriving at the water content of honey. Density varies slightly with temperature but allowance can be made for this.

The *viscosity* of a liquid, on the other hand, is a measure of its flow properties, and is not necessarily connected with its density. Heavy oils, for example, flow slowly and are of high viscosity, but of lower specific gravity than water, on which they would float. The viscosity of honey, though a distinct property, is related to the specific gravity because honey is not a simple liquid like an oil, but a solution of sugars in water. The viscosity of honey varies considerably with the temperature.

When the test of density was applied to heather honeys, many samples were found to have too high a water content to be included within the limits of the National Mark scheme. As it seemed that this excess of moisture did not in all cases allow the honey to ferment, these honeys were examined to see if they possessed any special property that might reasonably excuse departure from this standard. The jelly-like nature of ling honey has long been known in connexion with the production of bottled heather honey. Because of this property it is not possible to use the centrifugal extractor in the ordinary way. The usual method is to press the combs and so destroy them. In recent years the Dutch have to some extent used a machine that, by dropping loose steel rods into the cells, breaks up the jelly structure and allows some air to enter. If combs are put into the ordinary extractor within twenty minutes or so of being so treated, it is then possible to remove the honey by centrifugal force in the usual way.

The Flow Properties of Heather Honey. It has been shown¹ that honeys from a great variety of sources, not including heather, behave almost as "true fluids." This means that if, for example, such honeys are forced through narrow tubes under pressure, they flow at a rate proportional to the pressure applied, and also that no amount of stirring,

¹ Paine, Gertler and Lothrop: Colloid Constituents of Honey, *Ind. & Eng. Chem.*, 26, 1934, 73-81.

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either caused by the flowing process itself or by deliberate mixing, will affect the ease of flow.

Now ling (*Calluna*) honey is quite unlike a "true fluid."¹ If it is forced through a tube, or if a small ball is allowed to fall through it, the rate of flow is not proportional to the pressure applied. For example, when the pressure is doubled it will yield at a rate which is far more than doubled. Moreover, newly-stirred honey, whether the stirring is deliberate or produced by flowing in some kind of test, flows much more readily than honey that has been left to stand for some time. Both these properties are well-known with other materials. The former has been called "structural viscosity" and the latter "thixotropy." With ling honey, the two are clearly connected. There is good reason to suppose that in the honey, the sugar molecules tend to arrange themselves into a sort of structure rather like scaffolding around a building. When the honey is stirred, or caused to flow, this structure is temporarily destroyed, and only re-establishes itself gradually, and it is natural that the bigger the pressure used, the more complete is the temporary destruction of the structure.

A convenient method of observing how far any particular honey shows such a capacity to form a structure has been described by Scott-Blair.² A $\frac{1}{4}$ -in. steel ball-bearing is dropped through a sample that has been allowed to stand for some time, then the sample is stirred thoroughly, and another ball is dropped. With ordinary honey the two balls will fall at the same rate, but with heather honey, the ball in the unstirred honey will fall many times more slowly than that in the stirred. If, for example, in a given sample the ball falls ten times as slowly, this honey is said to have a "thixotropy ratio" of ten. Thixotropy ratios depend on such things as temperature, size of ball used in test, etc., but under fairly standard conditions, they give a good indication of how much "structure" a honey is capable of building up. Some of the water in the honey is needed for this purpose, and it is known that water so utilized has properties different from those of ordinary water. Since honeys that show marked structure can presumably hold more water without fermenting than can structureless honeys, it is reasonable to suppose

¹ De Boer and Kniphorst: Thixotropie van Heidenhonig, *Chem. Weekblad*, 29, 1932, 526-534.

² Scott Blair: The Thixotropy of Heather Honey, *Jour. Phys. Chem.*, 39, 1935, 213-219.

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that water which is bound into the structure is not available for the use of ferment. Some ling honeys produce such a rigid structure that after some hours standing they set into solid jellies. Such honeys often give thixotropy ratios of as much as several thousand, i.e., a steel ball falls through them some thousands of times faster after vigorous stirring, than it did before.

It is important to inquire what plants give thixotropic honey, and whether the conditions of growth of the plant (soil, climate, etc.) affect the extent of the thixotropy or structural viscosity. For this purpose, samples of honey are required from sources that the beekeeper can guarantee.

There has been designed a test that necessitates only a few drops of honey, an obvious advantage, since a beekeeper could be sure of the source of a small corner of a comb, when he could not guarantee that the whole comb had been laid down from the same plant.

Although very small ball bearings are obtainable, there are serious technical difficulties in using the falling ball methods for such minute samples, and a flow method has been devised, this, however, involving the use of somewhat complex apparatus, so that it is intended for the research laboratory. In the meantime the authors would be grateful for samples of heather (ling) honey from any beekeepers who can guarantee a pure ling source, and supply some information as to the soil and climatic conditions where the plant grew. About a thimblefull of honey is ample.

The above methods are not the only possible ways of studying these phenomena. A great many methods are possible, but these have been chosen as the most suitable for this particular problem.

The Specific Nature of the Plant. It is a very curious fact that whereas most honeys derived from ling (*Calluna vulgaris*) are highly thixotropic, those derived from heathers such as *Erica cinerea* and *Erica tetralix* are not. Although Paine, Gertler and Lothrop (*loc. cit.*) were not looking for thixotropy among the honeys from so many sources which they examined, they could not have failed to note and comment on such a phenomenon had it occurred to any marked degree. With the possible exception of buckwheat, no plants that have been examined, give thixotropic honeys except ling (*Calluna vulgaris*), and the New Zealand plant manuka (*Leptospermum*

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scoparium). There may, of course, be others, but even so the phenomenon is exceedingly rare. Thixotropy must be due to the presence of some chemical substance that reaches the honey through the plant. Its presence clearly depends on the nature of the plant, and possibly, also on the chemical composition of the soil in which the plant grows. This matter is being further investigated at Rothamsted.

Details of the Thixotropy Test. Since the thixotropy ratio obtained for a honey depends to some extent on the exact way in which the test is done, it is as well that the following method should be followed as closely as possible.

The honey is poured into a tube known as a "100-cc. Nessler tube" so as to fill the tube right to the top, and left to stand overnight. (The tubes may be obtained from manufacturers of chemical apparatus at a cost of about 2s.) Granulated honey must not be used for the test. The tubes are marked with two lines about $2\frac{1}{2}$ in. apart. For the first test the $\frac{1}{2}$ -in. ball bearing is laid on the surface of the honey in the middle of the tube* and the times at which the centre of the ball passes the two lines are recorded. The second hand of an ordinary watch is adequate for this purpose, though if a stop watch is available, it is somewhat more convenient.

For the second test a metal disk perforated with holes is mounted on a metal rod so that it just slides freely in the glass cylinder.†

The honey is stirred by pushing this stirrer to the bottom of the cylinder and withdrawing it; this is done twice. Immediately after this, the ball-bearing is dropped and the time taken in passing the two lines is recorded as before.

The "thixotropy ratio" is simply obtained by dividing the time taken for the ball to fall between the marks in the first test by that taken in the second test. In order to see the ball in honeys that are opaque owing to air bubbles, it is best to stand the tube on a window-sill with the daylight for background, and to stand back slightly from the tube when making the observations. A good light is essential.

Since writing this article, the authors have read with great interest a paper by Mr. J. Pryce Jones (*Bee World*, August 1936), in which the thixotropy of honey is discussed.

* If the honey is opaque with air bubbles, the ball, to be visible, may have to be placed slightly to one side, but it should never be allowed to fall near the wall of the tube.

† Arrangements are being made to have these placed on sale.

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Milk Marketing Scheme: Milk Contract Prices, 1936-37.
The price and other terms of the wholesale milk contract to operate for the period October 1, 1936, to September 30, 1937, have been agreed between the Milk Marketing Board and the Central Milk Distributive Committee, representing purchasers of milk by wholesale, and the contract has been prescribed by the Board. The new contract is similar to the previous contract as amended by the Minister and embodies the adjustments regarding which assurances were given to the Minister by the Board.*

The monthly wholesale prices of milk for liquid consumption will be the same as in 1935-36, viz; 1s. 5d. per gal. from October to March, 1s. 4d. in April, 1s. in May and July, 1s. 1d. in July and August, and 1s. 3d. in September, giving an average price of 15s. 3d. per 12 gal. over the year. An additional $\frac{1}{2}$ d. per gal. is to be paid on purchases during May, 1937, being the distributors' share of a joint contribution of $\frac{1}{2}$ d. per gal. for milk publicity. The corresponding yearly prices in each year since the commencement of the Scheme have been as follows:—

1933-34	..	..	14s. 4d.	per 12 gallons in the S.E. region.
			13s. 9d.	" " " other regions.
1934-35	..	..	15s. 1d.	" " " all regions.
1935-36	..	..	15s. 3d.	" " " "

The prices of milk used for manufacture are contained in a separate schedule of rebate conditions. The formulæ for ascertaining the prices to be paid monthly for milk manufactured into cheese and butter are given below:—

<i>Product</i>	<i>Price per Gallon</i>
Cheese, other than soft curd and cream cheese and Stilton cheese, manufactured from milk delivered in (a) months Oct., 1936, to Feb., 1937, and Sept., 1937.	The weighted average less 1½d. of (1) the average price per lb. for the previous month of the Finest White New Zealand cheese, and (2) the average of (a) the average price per lb. for the previous month of Finest White Canadian Cheese (excluding old and exceptional quotations), and (b) the average price for the previous month of Finest White Canadian cheese New Season's Make. The "weights" to be used are the total imports of New Zealand and Canadian cheese respectively in the month preceding the "previous month."

See this *Journal*, July, 1936, page 353, and September, 1936, page 567.

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<i>Product</i>	<i>Price per Gallon</i>
(b) Other months.	The average price per lb. for the previous month of Finest White New Zealand cheese, less 1½d.
Stilton cheese.	1d. more than the prices for other hard cheese calculated as above.
Soft curd and cream cheese.	7½d.
Butter manufactured elsewhere than in Cornwall.	The weighted average price per cwt. in the previous month of New Zealand Finest, Australian Choicest and Danish butter, less 16s. per cwt., divided by 265 from October, 1936, to February, 1937, and in September, 1937, and by 285 from March to August, 1937, plus 1/10th of a penny, subject to a minimum of 3½d.
Butter manufactured in Cornwall.	The "weights" to be used are the total imports of New Zealand, Australian and Danish butter respectively in the month preceding the "previous month."
	The above weighted average price of imported butters less 16s. per cwt., divided by 225 from October, 1936, to February, 1937, and in September, 1937, and by 245 from March to August, 1937, plus 1/10th of a penny, subject to a minimum of 3½d.

The prices for milk manufactured into condensed milk for home consumption and into milk powder are 6d. and 5½d. per gal. respectively, plus, in each case, the excess over 4½d. of the simple average of the prices to be paid for milk manufactured into hard cheese (other than Stilton) during the preceding three months. The price of milk for tinned cream is to be increased by ½d. to 6½d. during the period January-September, 1937. Other prices are unchanged from the previous year.

A premium of 1d. per gal. over the above-mentioned prices is to be paid for milk used for manufacture in the Metropolitan Police district or the City of London. For milk manufactured in other towns and cities, with more than 60,000 population, into a product for which the scheduled price is less than 7½d. per gal., a premium of ½d. per gal. or such lesser sum as will bring the price up to 7½d. per gal. is payable.

The level delivery premiums of 1d. and ½d. per gal. for exact daily deliveries and daily deliveries with a maximum variation of 10 per cent. are continued. In compliance with the Minister's request, the contract now permits the parties to agree at the time when it is made whether short deliveries on any day shall be penalized by the loss of the premium on the whole of the day's delivery or by payment by the vendor of 2d. per gal. on the amount of the deficiency.

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Appropriate minimum retail prices are again prescribed at the rates previously operating, and there is provision for sales at the farmhouse door being made at 1d. per qrt. less than the appropriate minimum.

Prices, etc., for August, 1936. Pool prices and gross rates of producer-retailers' contributions for August, 1936, are given below, with comparative figures for July, 1936, and August, 1935. The wholesale liquid milk price was 1s. 1d. per gal. in each month.

Region	Pool Prices			Producer-Retailers' Contributions		
	August 1936	July 1936	August 1935	August 1936	July 1936	August 1935
	d.	d.	d.	d.	d.	d.
Northern ..	9½	9½	10	3	3	2 ¾
North-Western ..	9½	9½	10	3	3	2 ¾
Eastern ..	10	10	10 ½	2 ½	2 ½	2 ½
East Midland ..	9 ¾	9 ¾	10	2 ¾	2 ¾	2 ¾
West Midland ..	9 ½	9 ½	9 ½	3	3	2 ¾
North Wales ..	9 ½	9 ½	10	3	3	2 ¾
South Wales ..	9 ½	9 ½	10 ½	3	3	2 ¾
Southern ..	10	10	10 ½	2 ¾	2 ¾	2 ¾
Mid-Western ..	9 ½	9 ½	9 ½	3	3	2 ¾
Far-Western ..	9 ½	9 ½	9 ½	3	3	2 ¾
South-Eastern ..	10 ½	10 ½	10 ½	2 ¾	2 ¾	2 ¾
Unweighted Average	9.70	9.68	10.05	2.85	2.86	2.53

The pool prices and producer-retailers' contributions do not make allowance for any premiums earned by individual producers for special services or level deliveries, nor for the accredited producers' premium of 1d. per gal.

The number of accredited producers was 18,035 and the sum required for the payment of the premium to them was equivalent to a levy of 0·347d. per gal. on all milk.

The inter-regional compensation levy was fixed at 1 ½ d. per gal. on liquid milk sales, compared with 1 ¼ d. per gal. in August, 1935. A levy of ¼ d. per gal. was made for general expenses.

Sales on wholesale contracts were as follows:—

	August 1936 (estimated)			August 1935		
	Gal.			Gal.		
Liquid	45,820,956			45,033,627
Manufacturing	34,179,538			25,619,893
			<hr/>			<hr/>
			80,000,494			70,653,520
Percentage liquid sales ..			57.28			63.74
Percentage manufacturing sales ..			42.72			36.26

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The average realization price of manufacturing milk during August was 5·256d. per gal. compared with 5·73d. per gal. for August, 1935. The quantity of milk manufactured into cheese on farms was 2,519,131 gal. compared with 2,712,414 gal. in July and 1,843,149 gal. in August, 1935.

Farmhouse Cheese. The Board have agreed to make payments to producers who convert milk of their own production into cheese during the year October, 1936, to September, 1937, at the following rates per gal. of milk so used:—

Milk converted into :—		
Hard Cheese	Caerphilly or Soft Cheese	
October, 1936, to April, 1937	4½d.	4d.
May to September, 1937 ..	3½d.	3d.

These prices represent a reduction of 1d. per gal. on the corresponding payments for the previous year. Payment is conditional on compliance with conditions similar to those that were in force in the previous year.

Complaint against the Operation of the Scheme. The Committee of Investigation for England have reported to the Minister on a complaint as to the operation of the Scheme made by a Hastings firm, formerly retailers of skim milk. The complainants were aggrieved by the prescription by the Board, as one of the conditions of the allowance of rebates to manufacturers in respect of milk used for manufacture, that skim milk should not be sold for use in liquid form for human consumption, and said that the effect of this prescription had been to deprive them of their supplies of skim milk and to put them out of business. The Committee found that the act complained of was contrary to the interests of the complainants, but that it could not be said to be not in the public interest. In view of the Committee's findings, no action has been taken by the Minister under section 9 (5) of the Agricultural Marketing Act, 1931.

Proposed Amendments of the Scheme. Thirteen objections and one representation relative to the proposed amendments of the Scheme were submitted to the Minister, and, in accordance with the requirements of the Agricultural Marketing Act, 1931, the Minister has directed a public inquiry to be held into the objections. The inquiry will be opened at 10.30 a.m. on Monday, October 26, 1936, at the Middlesex Guildhall, Westminster, London, S.W.1, and will be conducted by Mr. N. L. C. Macaskie, K.C.

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Milk Products Marketing Scheme. The time within which objections and representations may be made with respect to this scheme was extended to September 30, 1936, to meet the request of certain trade organizations for longer time in which to consider the scheme.

Potato Marketing Scheme: Riddle Regulations. The Board on August 27 made new riddle regulations to operate until further notice. A minimum riddle of $1\frac{1}{2}$ in. has been prescribed for King Edward and Red King, and a riddle of $1\frac{3}{4}$ in. for all other varieties. In Scotland, however, the minimum riddle for Golden Wonder is $1\frac{1}{2}$ in. after September 30, 1936, and for the five weeks ending September 30, 1936, Kerr's Pink had to be dressed over a minimum riddle of 2 in.

Purchase of Potatoes in Scotland. In view of the low prices prevailing for potatoes in Scotland, the Board decided on August 27 to commence buying supplies of Great Scot and maincrop varieties of potatoes suitable for re-sale later in the season. The price offered by the Board is 50s. od. per ton for delivery until December 31, 1936, with monthly increases thereafter, and a payment of 30s. od. per ton will be made immediately after purchase.

Pigs and Bacon Marketing Schemes: Pig Prices for September, 1936. The basic pig price (Class I, Grade C) for September, 1936, was 11s. 11d. per score, compared with 11s. 6d. for August. This price is the highest so far reached this year, and was brought about by an increase in the cost of the feeding-stuffs ration as compared with the previous month from 7s. 10d. to 8s. 1d. per cwt. and to a rise in the ascertained bacon price from 90s. 8d. to 95s. 7d. per cwt. The realization value of offals declined from 8s. 8d. to 8s. 6d. per pig.

Sugar-Beet Marketing Scheme. Six objections were submitted relative to the Sugar-Beet Marketing Scheme. In accordance with the requirements of the Agricultural Marketing Act, 1931, the Minister of Agriculture and Fisheries and the Secretary of State for Scotland have appointed Mr. F. J. Wrottesley, K.C., to hold a public inquiry into the objections. The Inquiry, which will be conducted in accordance with the Agricultural Marketing (Public Inquiry) (Great Britain) Rules, 1932, will be opened at 10.15 a.m. on Thursday, October 8,

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1936, at the Middlesex Guildhall, Westminster, London, S.W.1.

Supplies and Prices of Maincrop Potatoes in the 1935-36 Season: *Supplies.* The situation with regard to the supply of maincrop potatoes in the 1935-36 season was in marked contrast with that in 1934-35, when the home crop was well above average and import requirements were virtually negligible. In 1935-36, both the acreage under potatoes in Great Britain and the estimated yield per acre showed a considerable decline compared with the previous season and the average of the preceding ten years, and the total production of potatoes was lower than in any season since 1931-32.

In these circumstances, no special measures were found necessary by the Potato Marketing Board for regulation of the marketing of home-grown potatoes. Apart from the first three months of the season, when it was required that potatoes for home consumption must pass over a minimum riddle of $1\frac{1}{2}$ in., the basic minimum riddle of $1\frac{1}{2}$ in. was in operation throughout. The Potato Marketing Board also made provision, in special cases, for the sale for human consumption of potatoes slightly below the ordinary minimum standard of size.

In consequence of the short home-crop, shipments to Great Britain from Northern Ireland and imports into the United Kingdom were considerably greater than in the previous season. Even so, the total available supplies of maincrop potatoes were about 450,000 tons (12 per cent.) lower than in the three preceding seasons, but were very similar to the quantities available in 1930-31 and 1931-32.

The following table shows, for each of the past six seasons, the estimated total production of potatoes in Great Britain and the maincrop supplies available for home consumption after deducting first earlies, exports and seed, and adding shipments to Great Britain from Northern Ireland and imports into the United Kingdom.

	Total Production (ooo tons)	Approximate Net Maincrop Supplies*
1930-31	.. .. 3,603	.. 3,180
1931-32	.. .. 3,154	.. 3,270
1932-33	.. .. 4,450	.. 3,740
1933-34	.. .. 4,555	.. 3,750
1934-35 4,464	.. 3,740
1935-36 3,765	.. 3,290

* Including wastage and livestock feed.

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Regulation of Imports. Imports of potatoes into the United Kingdom were controlled, as in the previous season, under the Potato (Import Regulation) Order, 1934. In view of the general shortage of potatoes on the Continent, however, and the relatively high prices ruling in the exporting countries, imports did not, in fact, reach the maximum quantities permitted under the Order.

In the early part of the season, home-produced supplies were considered adequate for all purposes, and only nominal import quotas were prescribed for the months of September, October and November. A sharp rise in prices in December, however, necessitated the release of an emergency quota. In the succeeding three months, imports were on a considerable scale, but were substantially less than the total permitted quantities. In these circumstances, the importing interests applied to the Import Duties Advisory Committee for the remission of the duty of £1 per ton on imports of maincrop potatoes from foreign countries and the Irish Free State, on the ground that the duty made importation unremunerative. The Committee recommended the temporary remission of the duty, and it was accordingly removed on March 26. Imports in April and May showed a considerable increase on previous months, as supplies of home-grown potatoes were being rapidly exhausted. With the advent of the new season's supplies, however, the exceptional situation was considered to have passed, and, on the recommendation of the Import Duties Advisory Committee, the normal duty of £2 per ton on all potatoes became payable on July 1.

Over the whole season from September 1, 1935, to June 30, 1936, imports amounted to about 123,000 tons.

The following table shows imports of maincrop potatoes into the United Kingdom in each month of the 1935-36 season compared with the two previous seasons:—

		1933-34 Tons	1934-35 Tons	1935-36 Tons
September	..	1,000	200	100
October	..	2,600	1,700	800
November	..	3,600	700	1,000
December	..	2,700	500	5,700
January	..	2,400	1,500	21,800
February	..	1,300	500	17,200
March	..	1,200	1,100	18,900
April	..	700	400	24,000
May	..	900	500	26,400
June	..	500	1,400	7,300
		<u>16,900</u>	<u>8,500</u>	<u>123,200</u>

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Northern Ireland Supplies. Shipments from Northern Ireland to Great Britain showed a very considerable increase over those of recent years, amounting to 235,000 tons as against 127,000 tons in 1934-35 and 122,000 tons in 1933-34.

Prices. Wholesale prices in 1935-36 were appreciably higher than in any of the three preceding seasons, and were similar to those ruling in 1930-31, when home production and total supplies approximated to those of the past season. The usual seasonal fluctuations during September and the beginning of October were followed by a steady period until the beginning of December. During December, both growers' and wholesale prices rose rapidly, but growers' prices declined during the latter half of January. Conditions remained generally stable from that time until the latter half of April, when growers' prices again rose to about the January levels. During the last few weeks of the season, prices tended to fall away rapidly. The general tendency over the season as a whole, however, was for prices to rise as the smallness of the home crop made itself felt.

The following table shows the average monthly wholesale price of potatoes* in seven of the principal markets in England and Wales during the past three seasons. The wholesale price index, based on prices in the corresponding months of 1911-13, is also given for each month.

Month	1933-34		1934-35		1935-36					
	Per ton	Index	Per ton	Index	Per ton	Index				
	s.	d.	s.	d.	s.	d.				
September	73	6	99	117	0	158	108	6	147
October	79	6	110	109	0	151	109	6	152
November	82	0	115	103	6	146	114	0	160
December	80	0	112	95	0	133	132	6	185
January	79	6	104	92	6	121	154	0	201
February	77	0	100	89	6	116	154	0	200
March	76	0	97	85	0	108	152	0	193
April	81	0	89	86	0	95	149	6	164
May	80	6	90	101	6	113	156	0	174
June	77	6	82	129	0	137	150	6	160
Mean	78	6	100	101	0	128	138	0	174

* Average of 1st and 2nd qualities Majestic and King Edward.

Retail prices were appreciably higher than in the three previous seasons, but did not fully reflect the rise in wholesale prices. The averages of the monthly retail indices from September to May in the four seasons 1932-33, 1933-34, 1934-35 and 1935-36 were 113, 108, 124 and 148 respectively.

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Milk Acts, 1934 and 1936: Manufacturing Milk.
 Advances made by the Ministry up to September 15, 1936, in respect of manufacturing milk were as follows:—

Section		Period of Manufacture	Gallons	Amount
1	(a) <i>Milk Marketing Board for England and Wales.</i> In respect of milk: Manufactured at factories other than the Board's	April, 1934, to July, 1936	453,689,826	£ 2,142,371
2	Manufactured by the Board ..	April, 1934, to Sept., 1935	2,573,662	12,850
3	Made into cheese on farms ..	April, 1934, to March, 1936	32,236,042	175,755
	Total for England and Wales		488,499,530	2,330,976
6	(b) <i>Government of Northern Ireland.</i> In respect of milk: Manufactured into cream and butter at registered creameries ..	April, 1934, to June, 1936	49,834,818	330,268
	TOTAL ..		538,334,348	2,661,244

Milk in Schools Scheme. Exchequer contributions up to September 15, 1936, towards the expenses of the Milk Marketing Board for England and Wales in respect of the supply of 40,096,574 gal. of milk to schoolchildren at reduced rates during the months October, 1934, to June, 1936, amounted to £755,582. From October, 1935, to June, 1936, 17,246,829 gal. of milk were consumed as compared with 18,583,101 gal. in the corresponding months of the first year of the scheme.

Revised Arrangements were submitted by the Board and approved by the Minister on August 19 to bring within the scope of the scheme the following categories of schools analogous to those already eligible:

Elementary Schools recognized by the Board of Education as efficient.

Duke of York's School, Dover.

Elementary Schools under the control of the War Office.
Occupational Centres for mentally defective children under the age of 16, and

Residential Poor Law Schools.

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Cheese-Milk Price. For the purpose of payments under the Milk Acts, 1934 to 1936 (whether by the Exchequer to Milk Marketing Boards, or by Boards to the Exchequer), in respect of milk used for manufacture, the cheese-milk price has been certified by the Minister and the Secretary of State for Scotland to be 5·89d. per lb. for the month of September, 1936. This exceeds the Standard price for the month under the Acts, and no advances, therefore, will be payable in respect of milk manufactured in Great Britain during September.

The Cattle Fund. Payments under the Cattle Industry (Emergency Provisions) Acts, 1934 to 1936, to producers of certain classes of fat cattle in Great Britain and Northern Ireland amounted by September 15 to £7,600,824. These payments were in respect of 3,210,199 animals, the average payment per beast being £2 7s. 4d. Some 961,000 imported animals have been marked at ports (excluding Northern Ireland) since August 6, 1934, under the Marking of Imported Cattle Orders, 1934 and 1935.

Wheat Act, 1932 : Sales of Home-grown Wheat—Cereal Year, 1936-37. Certificates lodged with the Wheat Commission by registered growers during the period August 1 to September 4, 1936, cover sales of 284,742½ cwt. of millable wheat, as compared with 1,848,112 cwt. in the corresponding period (to September 6) in the last cereal year.

Ascertained Average Price of Home-grown Millable Wheat in 1935-36. After consultation with the Wheat Commission, the Minister has made the Wheat (Ascertained Average Price) Order, 1936, certifying and prescribing that, during the cereal year ended July 31, 1936, registered wheat growers sold 33,650,000 cwt. of millable wheat of their own growing at an average price of 5s. 9·231d. per cwt.

Final Deficiency Payment to Wheat Growers for 1935-36. The Wheat Commission dispatched cheques on September 11 to 92,626 registered growers in respect of the final payment of deficiency payments for the cereal year 1935-36. The aggregate amount involved was approximately £1,193,000, but, after adding 1,098 further payments in relation to which, for various reasons, the Commission have had to investigate the title of persons claiming deficiency payments, the amount disbursed in this final payment will be about £1,229,000.

This will bring the total deficiency payments for the year, including the advance payments made in December, 1935.

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and in February, April and July, 1936, to approximately £5,644,000, or an average of just over £60 per registered grower. The deficiency payment for 1935-36 is equivalent to 3s. 4½d. per cwt. (approximately 15s. 1d. per quarter) in respect of all sales of wheat credited to growers for that year from wheat certificates delivered to the Wheat Commission.

Approximately 33,650,000 cwt. of millable wheat were sold by the 93,724 growers who have qualified for deficiency payments, and 209,511 certificates relating to the sales of this wheat were delivered to the Wheat Commission.

Fat Stock : Carcass Sale by Grade and Dead-weight.
 During the eight months to August 31, 1936, over 3,000 separate quotations were issued by the Ministry's graders for stock offered under the Grade and Dead-weight Scheme. In the same period, 6,766 cattle, 22,459 lambs and sheep and 5,452 pigs were dealt with, as compared with 6,955 cattle, 15,783 lambs and sheep and 2,583 pigs received in the first eight months of 1935.

Cattle were mainly consigned to the Birmingham and Yorkshire grading centres, which also dealt with about 50 per cent. of the sheep. Manchester and Liverpool, other important centres for sheep, dealt with a total of 8,769 during this period. Of the total of 5,452 pigs consigned under the scheme, 2,601 were sent to London. This figure exceeds the total number of pigs dealt with under the scheme in London during the whole of 1935.

The following table shows the grading of the carcasses at all grading centres during the period from January to August, 1936:—

Class of Stock	Carcass Grade				Un- graded	Total
	Super*	I	II	III		
<i>Cattle.</i>						
Bullocks and Heifers	48	1,881	3,604	438	56	6,027
Other classes ..	—	197	367	131	44	739
<i>Sheep.</i>						
Lambs	—	6,942	7,226	1,631	596	16,395
Other sheep	—	3,348	2,053	456	207	6,064
<i>Pigs.</i>						
Pork pigs and sows	—	2,884	2,210	280	78	5,452

* This grade is for bullocks and heifers only.

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An interesting feature of the arrangements recently completed for dealing with fat stock from Northern Ireland under the scheme is that all such stock is offered through the local branches of either the Ulster Agricultural Organization Society or the Ulster Farmers' Union. Producers are thus enabled to secure the benefits of consigning in bulk.

Demonstrations at Shows and Exhibitions. Fruit grading demonstrations, as well as exhibits of National Mark produce, will be staged at the Marden and District Commercial Fruit Show on October 7 and 8, and at the Imperial Fruit Show, Renshaw Hall, Liverpool, from October 30 to November 7. Demonstrations of apple packing will be given at the Norfolk Fruit Show, Norwich, on October 16 and 17.

At the Dairy Show to be held at the Royal Agricultural Hall, London, from October 20 to 23, the Ministry's exhibit will consist mainly of National Mark dairy produce—butter, eggs, and various types of cheese.

OCTOBER ON THE FARM

E. J. ROBERTS, M.A., M.Sc.

OCTOBER, like the preceding month, is a time of great activity on arable land, much of the winter cereals and beans having to be sown, and harvesting of the root crops being in full swing. While a break in the weather at this time of year has serious consequences on most arable farms, the effects are particularly felt on the heavier land, where wheat has to be sown and the mangold crop carted off.

Potatoes. The recent prices ruling for potatoes are disappointing, but the existence of the Potato Marketing Board gives justification for the hope that the position may be righted by the time the crop is taken out of the clamps. In addition, reports of light crops from many districts indicate that prices may be very different before spring. An interesting criticism of the Board's riddle regulations was heard last year in a Midland county. The complaint was made that, with a large riddle in force, a large proportion of the crop in that county passed through the riddle, while the Lincolnshire growers were able to sell most of their crop. On being asked whether a smaller riddle would be more just to his county, this grower complained that that would be equally unfair, since buyers would prefer to buy in Lincolnshire, where the produce would contain more large tubers! One cannot envy the position of a Board that is expected to be able to adjust the position arising through some districts growing more marketable potatoes than others!

The lifting of the potato crop is much simplified by the various ploughs and spinners that are now in general use. Many express surprise, however, that a fairly large proportion of the crop should be dug by the "graip." The graip, or potato fork, in the hands of an efficient user in light land can put up a very good account of itself; this can be realized when observing a number of Irish workers specially organized and selected for this work. The proportion of the crop that is hand-raised is smaller, however, in the main crop than in the earlier crop. This is probably due to the smaller size and greater value of the tubers of the earlier crop, making it important that no tubers should be left covered by the soil. In addition, a greater proportion of the first and second

OCTOBER ON THE FARM

earlies is lifted before the crop reaches maturity and the crop may be more easily damaged by mechanical lifters.

Many experienced growers consider, however, that ploughs and spinners are often blamed for damage that is really caused during the filling and emptying of the carts, but that is not observed until the clamps are opened. The modern spinner, properly handled, is a very efficient machine as can be judged by the large number in use.

Various materials are used for covering potatoes before the soil is put on the clamp. Straw is the most common, and bracken is much used in some districts. Seaweed is also suitable, and has the advantage that it checks sprouting. There is no need for soil if a good layer of seaweed is used. A party of farmers from North Wales, on a visit to the Dublin district at the end of May some years ago, were very surprised to observe that, when a potato clamp that had been covered with seaweed was opened, the tubers were entirely devoid of sprouts.

Sugar-Beet. A great demand on the labour resources of the farm is now made by the beet harvest. Lifting, knocking off the soil, topping and loading are still mostly carried out by hand. There are many horse-drawn beet lifters in use, and lifters of the one- or two-rowed type for use with tractors can also be seen. It is often asked whether the methods of cultivating and harvesting of this crop in Britain are not inefficient compared with those on the Continent, where beet has been cultivated much longer than in this country. A tour of the main beet-growing areas of Europe was recently carried out by two British experts, in order to examine the methods of cultivating and harvesting of sugar-beet, and to take particular note of mechanical appliances used. The observations and conclusions are contained in the Ministry's Bulletin No. 102 (*Sugar-beet on the Continent*), by F. Rayns and S. J. Wright.* The authors consider that, as a whole, beet-growing soils on the Continent are definitely easier to work, more suited to the crop and less varied in character than the beet soils of this country. As regards harvesting, the organization in the field was not considered to differ essentially from our own practice. Many kinds of lifters of

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 1s., post free 1s. 2d.

OCTOBER ON THE FARM

the loosener type were seen, but a considerable proportion of the Continental crop is lifted by hand with ordinary short-handled spuds. Topping is mostly done by hand, either with a chopper as the beets remain in rows on the ground, or with a hook, the worker standing upright and picking up the beet one by one with the point. Topping standards vary greatly on the Continent, being very light in some areas, as in South Sweden, and heavy in others, as in parts of Germany, where there is a tendency to regard stock feeding as of equal importance to sugar production.

The cleaning of the beet was found to be mostly carried out by knocking the roots together, as in this country. Cleaning on the ground by harrowing was mentioned in several districts, but was not actually seen in progress. Incidentally, an interesting experiment in beet cleaning was carried out on a large scale in England last season, when beets were unloaded at the foot of an elevator; as the roots were carried up the elevator to the wagon for delivery to the factory, they were thoroughly washed by a powerful spray of water. To revert to Continental methods, the use of light railways was found to be a notable feature in most European countries, where the grouping round the factories was closer, and temporary field lines could be connected with permanent systems of similar gauge running right into the factory.

Cereals and Beans. Early October is the best time for sowing wheat; much of the wheat will have been sown where it follows bare fallow. The past summer has been unfavourable for a successful bare fallow, and sowing on such land is later than usual. The wet summer, in addition to its effect on weeds, will also have caused a greater loss than usual of soluble plant-food from the soil, and an autumn fertilizer dressing will give the crop a good opportunity of establishing itself before winter. An autumn dressing can also be recommended where the crop follows grass, if wire-worm attack is feared. J. A. McMillan and F. Hanley (this JOURNAL, March, 1936), in an investigation on the effect of sowing fertilizers in contact with the seed of barley and sugar-beet, observed that when fertilizer was broadcast, the barley seedlings were enabled to grow away better from wireworm attack than on the plots getting none, while on plots where the manure was drilled in contact with the seed there was an

OCTOBER ON THE FARM

almost perfect plant. The writers recalled a similar experience 30 years ago by Mr. J. W. Moss, who gave his results in a paper at Chelmsford. Such experiences of the value of a good start give strong support to the case for autumn dressings when wheat follows grass and when wire-worm attack is feared.

It is a wise precaution to dress wheat seed with a preparation against bunt (covered smut). The prevalence of loose smut this summer has caused many seed growers to reach an erroneous conclusion about the efficacy of seed treatment. Loose smut cannot be prevented by chemical treatment, but bunt or covered smut is preventable. The well-known mercurial preparations, or dry copper carbonate, are easily used and very effective.

The bean crop is important on heavy land, and is considered by many to merit greater attention; it is a crop that makes an excellent preparation for wheat. The area grown for stockfeeding this year was just over 121,000 acres, less than a tenth of the area under oats. Winter beans should be sown early. The crop is very subject to attack by rooks and pigeons, and, since it is deeply sown and slow growing, remains a long time in the stage when it is appetising to birds, unless it is sown early before the soil gets cold. Lord Eltisley, writing recently on the bean crop in *The Farmer and Stock-Breeder*, noted that, where farmyard manure is not available, a dressing of superphosphate, well distributed on the land just before drilling, generally provides the stimulus required to grow a good crop on heavy land. It may be mentioned that the winter varieties are not suitable for areas where long, hard frosts are experienced. The capacity of the crop for recovery from frost is, however, greater than is often realized. A crop blackened by frost or an east wind, and appearing beyond hope to those with no experience of growing it, may throw off all traces of damage after a fortnight.

Cattle. Many of the younger cattle are brought indoors at the end of this month unless the weather remains mild. An opportunity is afforded for giving individual attention to the animals should it be necessary. The cattle may, for instance, require treatment for ringworm, an affliction that may cause great inconvenience on farms where there are many cattle. Some attacks are more difficult to eradicate than others, an

OCTOBER ON THE FARM

attack on one or two beasts soon spreading through the herd. Young animals, such as calves and yearlings, and stock in poor condition, are more subject to attack than older or thriving cattle. Some attacks are readily transmitted to human beings, and may be by no means easy to cure in the latter. What appears to be a variation in the nature of ring-worm attack is explained by the fact that it may be caused by a variety of fungi. This is explained in the Ministry's Advisory Leaflet No. 132,* in which the treatment is also described. Treatment is simple and effective but, as in the case of warble-fly treatment, it is the catching of the animals that is often responsible for delaying the work.

A bunch of heifers may have one or two animals with warts on the teats. If there are numerous warts, and if the heifers have not been bulled, it is better to put such animals aside for fattening. Those kept because of their breeding value may be treated by tying the warts tightly with string, when they eventually drop off.

Many bull sales are held this month, and breeders of dairy cattle can end up the month by a visit to the Dairy Show. There are few shows where a combination of performance and appearance in the exhibits is required to such an extent as at the Dairy Show. The competitions within the breeds and the inter-breed competitions focus attention on the best animals of these breeds. An interesting bull sale is held each year at the Hertfordshire Institute of Agriculture, St. Albans, when Dairy Shorthorn and Lincoln Red bulls by proved sires are put up to auction on the same day as the recorded pigs. In the last sale, for instance (October, 1935), all the young bulls (purchased as calves) were bred from long-lived sires that had proved their prepotency in the transmission of high milking capacity to their progeny. Thus, one of the progeny-tested sires, Ketteringham Milkman, the sire of four of the young bulls offered, had the following record:—

Average mature yield of 43 dams was 846 gal.

Average mature yield of 43 daughters of these dams was 963 gal.

Thus the daughters sired by the bull had an average of over 100 gal. more milk per lactation than their dams. This sale is not only of interest to the practical breeder, but also to those who have followed the research work and discussions of recent years on progeny-tested sires.

* *Ringworm in Cattle.*

OCTOBER ON THE FARM

Sheep. In most mountain flocks, the ewe lambs are sent off for wintering early this month. The general aspects of this system were discussed in these notes for April. In one part of Britain, where the amount of sheep scab is relatively high, a second double-dipping is enforced in order to ensure that sheep that are sent to other counties for wintering do not spread it. With the draft ewes and wethers sold, and the ewe lambs away for their winter pastures, there remains only the bringing down of the flock to the lower grazings, and the tupping, which may be any time from the last week in October to early December.

With folded sheep, there may be trouble at this time of year through scouring, caused by a change from grass or forage crops to roots. The change should be made gradually. The manager of a farm, with a large flock of half-breds in South Wiltshire, stated recently that his experience had shown him the great value of bringing in the younger sheep to the fold early in August. In this way, they got used to folding before severe weather sets in; a previously high death-rate amongst the young ewes was, in this way, reduced to negligible proportions.

NOTES ON MANURING

F. HANLEY, M.A.,

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Winter Wheat. Estimates of the probable yield of the 1936 wheat crop suggest that in many districts it will be lower than the average, many farmers blaming the wet winter of 1935-36 and lack of sunshine during the growing season for this reduction. The influence of meteorological conditions on the yield of wheat cannot be denied, but it may be worth while considering the matter from the standpoint of the manuring of the crop, especially in the light of experimental results recently published.^{1, 2} There is ample evidence to suggest an important relationship between weather conditions, particularly rainfall, and the effect of manures on the wheat crop.

The chief fertilizers likely to be needed by wheat are those that supply phosphate and nitrogen; only on the lighter types of soil is there likely to be any appreciable response to potassic fertilizers. Wheat following potatoes or beans, or grown after "seeds" or bare fallow (especially if farmyard manure is applied), should not require anything more than a top dressing of a nitrogenous fertilizer—provided the preceding crops in the rotation received adequate dressings of phosphatic fertilizers. Where wheat is grown after a cereal crop, the soil is likely to contain much smaller quantities of available plant food, and it is usually desirable to supply both phosphate and nitrogen. The phosphate may take the form of 2 to 3 cwt. per acre of superphosphate. This should always be applied in the *autumn*, as it will then help in the establishment of a strong, well-rooted plant. There is little fear of any serious loss of phosphate through washing out by winter rains, as may happen with nitrogenous fertilizers.

Quantity of Nitrogenous Fertilizer. This will obviously vary with the actual "condition" or "heart" of the soil, but wheat responds well to nitrogen, and, when taken as a second cereal crop, up to 1½ cwt. per acre of one or other of the common nitrogenous fertilizers such as sulphate of ammonia,

¹ Garner, F. H., & Sanders, H. G.: *J. Agric. Sci.*, Vol. XXVI, Pt. 2, April, 1936.

² Watson, D. J.: *J. Agric. Sci.*, Vol XXVI, Pt. 3, July, 1936.

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nitrate of soda or nitro-chalk will usually give a profitable increase in yield, if applied at the right time. On land in better "condition," however, $\frac{1}{4}$ to 1 cwt. per acre is usually ample. On rich soils it is not safe to assume that a dressing of nitrogenous fertilizer is *always* desirable, for not only may it fail to give an economic return, but it may even prove detrimental to the subsequent growth of the crop. Evidence of such a harmful effect is given in one of the reports¹ referred to above, in which a reduction in yield is shown to have followed the application of nitrogenous dressings to wheat after potatoes, growing on land that had been well "done" for some years. The nitrogenous dressings apparently favoured lodging and disease. Whatever the quantity of nitrogenous fertilizer it is decided to use, careful consideration should be given to the question of the time at which it is to be applied.

Time to Apply the Nitrogenous Fertilizer. In this connexion a good deal of experimental work has been carried out in recent years, and the results confirm the importance of bearing in mind the question of weather conditions.

Should part of the dressing be applied in the autumn, or should the whole application be reserved until the spring? In what month should a spring application be made? Is it best to replace at the earliest opportunity, any nitrogen leached out during a wet winter, e.g., by a February dressing, or should the application be delayed until such time as it will tend to increase ear size rather than encourage the formation of more tillers?

The report¹ of the latest series of experiments carried out on this subject at Cambridge, and covering the period 1929-35, provides direct evidence as to the effect of weather conditions on response to nitrogenous fertilizer applied at different stages in the growth of wheat. Three times of application were compared, viz., autumn, February, and May, the fertilizer used being sulphate of ammonia. The best results were not obtained in all seasons from the same time of application. Given a wet winter, autumn dressings were ineffective, whilst May dressings were beneficial provided there was sufficient rainfall in June to wash them into the soil. On the other hand, when the winter was dry, the autumn dressings gave the best return. February dressings never gave the highest yield. Throughout these experiments, time of application appeared to be more important than

NOTES ON MANURING

quantity. The results of a further experiment, carried out on the 1936 crop, have not yet been published, but the writer is informed that, this season, nitrogen applied in May has given the best results. Bearing in mind the wet winter of 1935-36, it will be seen that this confirms the previous results.

The other report² referred to above describes a somewhat different type of experiment carried out at Rothamsted. Loss of nitrogen by leaching and any danger of drought limiting response to nitrogen were overcome by the use of pot cultures. The wheat was grown in pots in which the soil was kept adequately moist, but never wet enough to cause drainage from the pots, the results, therefore, relate to the effect of nitrogen under controlled moisture conditions. The manure used was nitrate of soda, and seven different times of application were compared, ranging from November to June. The nitrate of soda gave an almost constant increase in the yield of *grain*, whether the fertilizer was applied in November, January, March or May, but the method by which the increase was produced varied with the time of application.

Early applications gave a large increase in the number of ears and a small decrease in the size of grain and number of grains per ear, whereas late applications gave only a small increase in the number of ears, but also showed increases in the size of the grains and the number of grains per ear. Nitrate of soda applied after May gave no increase in yield of grain. Early application gave an increase in the yield of *straw*, but applications in late April, May or June had no effect on straw yield.

This experiment confirms the view that seasonal variations in the effects of nitrogen applied at different stages in the growth of the crop, as found in the field experiments, are largely due to variations in moisture supply, and, in general supports the findings of the field trials regarding the efficiency of a May application, *given adequate rainfall in June*. Chemical analysis of the grain from the pot cultures showed that late application led to a higher nitrogen content in the grain, indicating improved quality. The plants took up the same amount of nitrogen irrespective of whether it was applied early or late, but apparently more nitrogen found its way into the grain following the later applications.

Further field trials under a wider range of soil and climatic conditions are obviously desirable, but, in the meantime, the general position may be summarized in the terms of the

NOTES ON MANURING

recommendations made by the authors of the Cambridge report, who suggest that half the nitrogenous dressing should be applied at seeding time and half reserved for May application.

This recommendation, whilst applicable to land not in a high state of fertility, should obviously be interpreted with caution on land in good "heart," where autumn application of nitrogen may result in a "winter proud" crop. On such land it may be best to omit the autumn dressing and apply the spring dressing later than has been the practice in the past. There are no grounds for apprehension as to the effect of a late application of nitrogen on the standing powers of the crop. Plots receiving nitrogen in May have shown no greater tendency to lodge than plots receiving nitrogen in February.

Field Beans. Very few experiments have been carried out on the manuring of field beans, though the crop is one that responds well to proper manurial treatment, and, though the relatively low price of other high-protein food-stuffs tends to limit the demand for beans for feeding purposes, the crop has still a very definite place in the agriculture of some districts, especially those on the heavier types of soil. Such experimental evidence as is available is quite conclusive on two points: (1) the highly beneficial effect of an application of farmyard manure, and (2) the importance of an adequate supply of phosphate. The value of potash is less certain: if farmyard manure is used, additional potassic fertilizer seems to be unnecessary, but, if no farmyard manure is available, the evidence is in favour of giving the equivalent of 1 to $1\frac{1}{2}$ cwt. per acre of muriate of potash, the smaller dressing on heavy soils and the larger dressing on lighter soils.

Results of the rotation experiments at Saxmundham (East Suffolk) for a ten-year period, published some time ago, clearly indicated that beans benefit from farmyard manure applied anywhere in the crop rotation, but the heaviest yield was obtained when the application was made *direct* to the bean crop. As regards phosphatic fertilizer, however, 5 cwt. per acre of superphosphate gave an increase in yield of 6 to 8 bus. of beans per acre, irrespective of whether the application was made direct to the beans or to one of the preceding crops in the rotation. In other words, if a good dressing of

NOTES ON MANURING

phosphatic fertilizer is not applied elsewhere in the rotation, it is important that at seeding time the bean crop should receive 4 to 5 cwt. per acre of superphosphate, or its equivalent in the form of basic slag, in addition to any farmyard manure that may be available.

It has been generally recognized for some time that soluble phosphatic fertilizers play a specially important part in the growth of leguminous crops. The phosphate apparently has a beneficial effect on the development of the root nodules, on which the plant is dependent for its powers of utilizing atmospheric nitrogen. In addition to its effect on the actual yield of beans, however, soluble phosphatic fertilizer also appears to influence their chemical composition, not merely as regards content of phosphorus, but also nitrogen content. During a recent examination of produce from the Saxmundham experiments, chemical analysis showed that mature beans from plots receiving regular dressings of superphosphate contained an average of 4·46 per cent. nitrogen in their dry matter as compared with only 4·10 per cent. nitrogen in beans from plots that had received no phosphatic fertilizer for a number of years. This difference of 0·36 per cent. nitrogen is of interest to the stockfeeder who relies on beans as a source of protein, for, if the nitrogen is present as true protein, this difference is equivalent to approximately $2\frac{1}{2}$ per cent. protein and, though it was probably accentuated by the accumulated phosphate deficiency in this particular series of plots, this effect on composition cannot be ignored altogether.

There is little reliable evidence on which to compare the merits of superphosphate and basic slag for beans, and, provided a high-soluble slag is used, there is probably little to choose between the two. On the evidence of the Saxmundham experiments, however, superphosphate is definitely superior to bone meal for the bean crop. Plots receiving superphosphate gave a heavier yield of beans, with higher nitrogen content, than plots receiving bone meal.

PRICES OF ARTIFICIAL MANURES

Description.	Average prices per ton (2,240 lb.) during week ended Sept. 9.				
	Bristol	Hull	L'pool	London	Costs per Unit
Nitrate of Soda (N. 15½%)	£ s. 7 12d	£ s. 7 12d	£ s. 7 12d	£ s. 7 12d	£ s. 9 10
" " Granulated (N. 16%)	7 12d	7 12d	7 12d	7 12d	9 6
Nitrate of Lime (N. 13%)	7 od	7 od	7 od	7 od	10 9
Nitro-Chalk (N. 15½%)	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of Ammonia :—					
Neutral (N. 20.6%)	6 16d	6 16d	6 16d	6 16d	6 7
Calcium Cyanamide (N. 20.6%)	6 16e	6 16e	6 16e	6 16e	6 7
Kainite (Pot. 14%)	2 18	2 15	2 15	2 15	3 11
Potash Salts (Pot. 30%)	4 16	4 17	4 15	4 13	3 1
" " (Pot. 20%)	3 15	3 12	3 12	3 12	3 7
Muriate of Potash (Pot. 50%)	7 15	8 1	7 17	7 13	3 1
Sulphate .. (Pot. 48%)	9 6	9 13	9 9	9 4	3 10
Basic Slag (P.A. 15½%)	2 10c	2 0c	..	2 6c	2 11
" " (P.A. 14%)	2 6c	1 16c	1 16c	2 3c	3 1
Grd. Rock Phosphate (P.A. 26— 27½%)	2 10a	2 5a	2 10a	2 5a	1 8
Superphosphate (S.P.A. 16%)	2 19	..	2 19f	2 16g	3 6
" (S.P.A. 13½%)	2 15	2 13	2 15f	2 12g	3 10
Bone Meal (N. 3½%, P.A. 20½%) .. ..	..	6 10	6 5h	6 2	..
Steamed Bone Flour (N. 4%, P.A. 27½—29½%)	5 12	5 10	5 0h	4 15	..

Abbreviations : N = Nitrogen ; P.A. = Phosphoric Acid ;

S.P.A. = Soluble Phosphoric Acid ; Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage-paid prices.

§ Prices are for not less than 2-ton lots, nett cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. prices.

a Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater ; at Hull and Liverpool, f.o.r. neighbouring works, and at London, f.o.r. depots in London district. Fineness 80% through standard sieve.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 5s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra, for lots of 10 cwt. and under 1 ton 15s. extra, and for lots of less than 10 cwt. but not less than 2 cwt. 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails ; southern rails 1s. 3d. extra.

h Prices shown are f.o.r. Appleby Bridge.

¶ These are calculated by regarding a ton as comprising 100 "units" (equal parts of 22.4 lb.) so that a manure, for example, with 16 per cent. nitrogen, contains 16 such "units" in a ton. Then, if the price per ton of such a fertiliser be divided by the percentage figure, the deduced cost is that of a "unit" of that agent. Those in the table above are based on London prices. (For further explanation, see Advisory Leaflet No. 146, "The Valuation of Artificial Manures," obtainable from the Ministry, free of charge.)

NOTES ON FEEDING

CHARLES CROWTHER, M.A., PH.D.,

Principal, Harper Adams Agricultural College.

Mechanical Factors in Nutrition. The ideal ration is one that not only contains all the essential nutrients and accessory ingredients in optimum proportions, but also is palatable and suited in mechanical character and dietetic qualities to the class of animal for which it is intended. Guidance as to the desirable proportions of the different essential ingredients is obtained mainly by way of experiment, the results of which can eventually be co-ordinated into "feeding standards," but the problem of "suitability" is less amenable to experimental investigation, and in large measure must be left to intelligent observation and skilful "stockmanship" in the practical use of rations of diverse types.

It is a common experience in nutritional advisory work that rations that appear to be quite suitable in make-up fail to come up to expectation in practical application, and in such cases it is obvious that the fault must lie in defects of palatability, mechanical character, or other factors not taken sufficiently into account in drafting the ration.

Defects of palatability are easily detected and usually not difficult to overcome, but defects in mechanical character may be more easily overlooked, and may, indeed, vary considerably as between individual animals. Of these defects, that which is most obvious, and has, therefore, received most attention, is an unsuitable volume or bulkiness of the ration.

In text-books on nutrition it has always been laid down that the volume of the ration must be adapted to the capacity of the digestive organs. If the food is too compact the animal will never feel satisfied, and consequently will not do its best; it will try to make up the deficient bulk by consuming litter or anything else within reach. If, on the other hand, the ration is too bulky the animal will not be able to consume sufficient to ensure the production required from it.

In the rapid development of the scientific control of farm feeding during the present century, there was for a time a tendency to overlook this important practical point, and credit must be given to Boutflour for restoring it to its proper place in the construction of rations.

NOTES ON FEEDING

In mechanical factors, such as that of bulk, lie undoubtedly the explanations of many of the apparent discrepancies between practical experience and the results of feeding experiments. A case in point is the extraordinary diversity of opinion and experience as to the nutritive value of bran. The improvement of feeding results obtained when bran is added to certain rations, despite a lowering thereby of the available nutritive energy of the ration, is undoubtedly due partly, and probably largely, to the change effected in the mechanical characteristics of the ration whereby it becomes better suited to the animal. Where the ration is already suitable in bulk, an addition of bran is more likely to impair than to improve the results. This is well illustrated by one of Sheehy's experiments at Glasnevin, in which the effects of inclusion of bran in a concentrated pig ration were found to vary according to the proportion of bran used, the inclusion of 10-20 per cent. being beneficial, whilst 30 per cent. was detrimental.

The mechanical character of a dietary may be affected by a variety of factors, many of which contribute to the characteristic of bulkiness. Thus hay and similar fodders are bulky, partly because of their large content of fibrous material and partly because of their characteristic open texture. Among the concentrated foods also, differences of bulk are largely, but not entirely, correlated with fibre content. The relative bulkiness of foods may vary also according to whether they are compared in the dry or wet condition. Ground oats and bran, for example, are similar in bulkiness in the dry state, but in the wet state bran is decidedly the more bulky. Other methods of preparation of food, such as flaking, may also have considerable effects upon the physical properties.

In roots and similar succulent foods, bulkiness is determined by their high content of water, and the consequent turgidity of the cellular structure, rather than by fibre-content; the dry matter of roots ranks, in fact, as a relatively non-fibrous material.

In some instances the beneficial effect of the feeding-stuff may not be associated with bulk at all, but with the specific effect of some particular ingredient, such as the familiar laxative influence of the mucilage of linseed, or the purely lubricative effect of liquid paraffin. Other possible specific effects, about which little is known as yet, are associated with

NOTES ON FEEDING

the rate and extent of secretion of the digestive juices and of the assimilation of the products of digestion.

In rationing practice the percentage of dry matter in the ration is usually taken as a criterion of its bulkiness, but clearly this can at best be only a very crude and uncertain guide. The same difficulty must also beset any attempts to lay down minimum or maximum fibre standards for rations. The dietetic qualities of rations which determine their "suitability" are too complex to be measurable in terms of any simple standard, and in the present state of knowledge of the subject, one can do little more than apply "hit or miss" methods of adjustment to rations that, though quantitatively in conformity with "feeding standards," are found on trial to possess qualitative defects. In making such adjustments the stockman's eye on the physical character of the droppings still remains the best, if not indeed the only, available criterion.

Cacao Shell Meal. The discovery two years ago, that this by-product of the cocoa industry is relatively rich in Vitamin D, has revived interest in its possibilities as a feeding-stuff for farm livestock. Average samples contain about 15 per cent. of crude protein, 6 per cent. of oil, 46 per cent. of "soluble carbohydrates," 15 per cent. of fibre and 7 per cent. of mineral matters, figures not unlike those of wheat bran. It is fairly readily eaten by livestock, and if used in moderate quantities, along with other foods, is apparently quite wholesome. It contains a small proportion of the alkaloid theobromine and, therefore, its use in large quantities may be attended with a measure of risk, especially with the non-ruminant animals, and a few instances of illness following its use are recorded in the older literature. In one case, reported in 1921, horses that received 700 grm. (1.54 lb.) of cacao shell, containing 0.7 per cent. of theobromine, became seriously ill and several died. On the other hand, in recent tests at Reading, dairy cows consumed 2 lb. per head daily for several weeks without any ill effects. German experience indicates that it may safely be fed to cows and fattening cattle even up to 5 lb. per 1,000 lb. live-weight daily, especially along with molasses, and that it can also be used in moderate amounts in pig-feeding.

In addition to this possible risk, the cacao shell has hitherto suffered the further disadvantage of being regarded as very

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indigestible. This view has been based upon the results of a single digestion trial by Kellner nearly forty years ago, but must be considerably modified in the light of more recent tests. In Kellner's trial, only one-third of the organic matter of the cacao shell was apparently digested, and less than one-twentieth of its protein. In the more recent tests, digestion coefficients ranging from 40 to 55 per cent. were found for the crude protein, and 51 to 85 per cent. for the true protein. On the basis of his own data Kellner assessed the production starch equivalent of cacao shell at 34 per cent.; the new data raise this to 42 per cent., which places cacao shell meal—vitamin value and other specific properties apart—on a level with wheat bran.

Its one outstanding advantage is its richness in Vitamin D, which apparently arises not from the shell itself, but from the yeasts and other organisms that grow upon it during the processes of sun-drying and fermentation that are an essential part of the preparation of the cacao beans for commercial use. In the Reading test quoted above, the level of Vitamin D in butter produced under winter feeding conditions was raised by the use of cacao shell meal to that of summer butter. The point is one of practical importance in view of the growing interest in the qualitative aspects of the human dietary.

PRICES OF FEEDING STUFFS

Description.	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
Wheat, British ..	£ 7 5	£ 0 8	£ 6 17	72	s. d. 1 11	d. 1.03	% 9.6
Barley, Canadian, No. 3							
Western ..	7 10	0 8	7 2	71	2 0	1.07	6.2
" Persian ..	6 18*	0 8	6 10	71	1 10	0.98	6.2
" Russian ..	7 12	0 8	7 4	71	2 0	1.07	6.2
Oats, English, white ..	6 17	0 9	6 8	60	2 2	1.16	7.6
" black and							
" grey ..	6 17	0 9	6 8	60	2 2	1.16	7.6
" Scotch, white ..	8 7	0 9	7 18	60	2 8	1.43	7.6
" Canadian, No. 2							
Western ..	8 15*	0 9	8 6	60	2 9	1.47	7.6
Canadian, mixed							
feed ..	6 12	0 9	6 3	60	2 1	1.12	7.6
Maize, Argentine ..	6 10	0 7	6 3	78	1 7	0.85	7.6
" DanubianGal.Fox.	6 10†	0 7	6 3	78	1 7	0.85	7.6
" South African,							
No. 2 White Flat	7 0	0 7	6 13	78	1 8	0.89	7.6
Peas, Japanese ..	20 15†	0 14	20 1	69	5 10	3.12	18.1
Milling Offals:—							
Bran, British ..	6 2	0 15	5 7	43	2 6	1.34	9.9
" broad ..	6 12	0 15	5 17	43	2 9	1.47	10
Middlings, fine, imported ..	6 17	0 12	6 5	69	1 10	0.98	12.1
Weatings† ..	7 0	0 13	6 7	56	2 3	1.20	10.7
" Superfine† ..	7 12	0 12	7 0	69	2 0	1.07	12.1
Pollards, imported ..	6 5	0 13	5 12	50	2 3	1.20	11
Meal, barley ..	8 12	0 8	8 4	71	2 4	1.25	6.2
" grade 11 ..	7 17	0 8	7 9	71	2 1	1.12	6.2
" maize ..	7 0	0 7	6 13	78	1 8	0.89	7.6
" " germ ..	7 2	0 10	6 12	84	1 7	0.85	10.3
" locust bean ..	7 15	0 5	7 10	71	2 1	1.12	3.6
" bean ..	8 5	0 16	7 9	66	2 3	1.20	19.7
" fish (white) ..	14 10	2 0	12 10	59	4 3	2.28	53
Maize, cooked, flaked ..	7 5	0 7	6 18	84	1 8	0.89	9.2
" gluten feed ..	6 15	0 12	6 3	76	1 7	0.85	19.2
Linseed cake:—							
English, 12% oil ..	9 10	0 19	8 11	74	2 4	1.25	24.6
" 9% ..	9 0	0 19	8 1	74	2 2	1.16	24.6
" 8% ..	8 15	0 19	7 16	74	2 1	1.12	24.6
" 6% ..	9 2§	0 19	8 3	74	2 2	1.16	24.6
Cottonseed cake, English, Egyptian seed, 4½% oil ..	5 12	0 17	4 15	42	2 3	1.20	17.3
Cottonseed cake, Egyptian, 4½% oil ..	5 10	0 17	4 13	42	2 3	1.20	17.3
Cottonseed cake, decorticated, 7% oil ..	7 17†	1 7	6 10	68	1 11	1.03	34.7
Cottonseed meal, decorticated, 7% oil ..	7 17†	1 7	6 10	70	1 10	0.98	36.8

PRICES OF FEEDING STUFFS (continued)

Description	Price per ton	Manurial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Protein equiv.
Coconut cake, 6% oil ..	£ s. 6 15	£ s. 0 17	£ s. 5 18	77	s. d. 1 6	d. 0·80	16·4
Ground nut cake, 6-7% oil ..	7 0*	0 17	6 3	57	2 2	1·16	27·3
Ground nut cake, decorticated, 6-7% oil	8 2†	1 6	6 16	73	1 10	0·98	41·3
Ground nut cake, imported decorticated, 6-7% oil ..	7 17	1 6	6 11	73	1 10	0·98	41·3
Palm-kernel cake, 4½-5½% oil ..	6 15†	0 11	6 4	73	1 8	0·89	16·9
Palm-kernel cake meal, 4½% oil ..	6 12†	0 11	6 1	73	1 8	0·89	16·9
Palm-kernel meal, 1-2% oil ..	6 0	0 11	5 9	71	1 6	0·80	16·5
Feeding treacle ..	5 0	0 8	4 12	51	1 10	0·98	2·7
Brewers' grains, dried ale " " dried porter ..	5 5 4 17	0 10 0 10	4 15 4 7	48	2 0 1 10	1·07 0·98	12·5 12·5

* At Bristol. § At Hull. † At Liverpool.

‡ In these instances, manurial value, starch equivalent and protein equivalent are provisional.

NOTE : The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex-mill or store. The prices were current at the end of August, 1936, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then, since its manurial value is 19s. od. per ton as shown above, the cost of food value per ton is £9 1s. od. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 5d. Dividing this again by 22·4, the number of pounds of starch equivalent in one unit, the cost per lb. of starch equivalent is 1·29d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations, a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices :— N., 6s. 9d.; P₂O₅, 2s. 3d.; K₂O 3s. 4d.

FARM VALUES OF FEEDING STUFFS

The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

		<i>Starch equivalent Per cent.</i>	<i>Protein equivalent Per cent.</i>	<i>Per ton £ s.</i>
Barley (imported)	71	6·2	7 7	
Maize	78	7·6	6 10	
Decorticated ground-nut cake ..	73	41·3	7 19	
" cotton-seed cake ..	68	34·7	7 17	
(Add 10s. per ton, in each instance, for carriage.)				

The cost per unit starch equivalent works out at 1·91 shillings, and per unit protein equivalent 0·87 shilling. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The " food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the December, 1935, issue of the Ministry's JOURNAL, p. 955.)

FARM VALUES.

Crop	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm
Wheat	72	9·6	7 6
Oats	60	7·6	6 1
Barley	71	6·2	7 1
Potatoes	18	0·8	1 15
Swedes	7	0·7	0 14
Mangolds	7	0·4	0 14
Beans	66	19·7	7 3
Good meadow hay	37	4·6	3 15
Good oat straw	20	0·9	1 19
Good clover hay	38	7·0	3 19
Vetch and oat silage ..	13	1·6	1 6
Barley straw	23	0·7	2 5
Wheat straw	13	0·1	1 5
Bean straw	23	1·7	2 5

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d., post free 7d.

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Rothamsted Winter Lectures

SIR JOHN RUSSELL, Director of the Rothamsted Experimental Station, has again arranged that Mr. H. V. Garner, Guide-Demonstrator of this institution, and other members of the staff shall be available during the winter to deliver lectures on the experimental work of the station to members of chambers of agriculture and horticulture, farmers' clubs, farm workers' associations, agricultural societies and similar organizations. No fee will be charged for the lecturers' services, but participating societies will be expected to defray travelling and hotel expenses, and to make the necessary arrangements with the lecture-staff. Requests for lectures should give as long notice as possible. A syllabus of lectures and lecturers may be obtained on application to the Secretary, Rothamsted Experimental Station, Harpenden, Hertfordshire.

The Agricultural Index Number

THE August index number of prices of agricultural produce at 119 (base 1911-13 = 100) is 2 points above that of July, and 6 points higher than the figure ruling a year ago. If allowance be made for payments under the Wheat Act, 1932, and the Cattle Industry (Emergency Provisions) Act, 1934, the revised index becomes 124. Wheat, barley, oats, fat pigs, eggs, butter and hay are the principal commodities showing an increase in price compared with July, while on the other hand values for fat cattle and potatoes showed a seasonal fall.

Monthly index numbers of prices of Agricultural Produce. (Corresponding months of 1911-13 = 100.)

Month.	1931	1932	1933	1934	1935	1936
January	130	122	107	114	117	119
February	126	117	106	112	115	118
March	123	113	102	108	112	116
April	123	117	105	111	119	123
May	122	115	102	112	111	115
June	123	111	100	110	111	116
July	121	106	101	114	114	117*
August	121	105	105	119	113	119
September	120	104	107	119	121	—
October	113	100	107	115	113	—
November	112	101	109	114	113	—
December	117	103	110	113	114	—

Superseding figure previously published.

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Grain. Wheat at an average of 7s. 8d. per cwt. was 9d. higher than in July, and the index moves upwards by 10 points to 96. (If " deficiency payments " under the Wheat Act be taken into consideration, the index is 122.) Barley and oats also appreciated in price, the former from 6s. 4d. to 7s. 7d., and the latter from 6s. 4d. to 6s. 10d. per cwt. The respective indices have risen by 16 points to 100 and 15 points to 98. In August last year wheat averaged 4s. 10d., barley 7s. 10d. and oats 6s. 5d. per cwt., the relative indices being 60, 103 and 92.

Livestock. At 34s. 5d. per live cwt. the average price for second quality fat cattle showed a decline of 1s. 3d. from that of July, but owing to the reduction being less pronounced than in the base years the index at 102 is 2 points higher; the effect of adding the subsidy under the Cattle Industry (Emergency Provisions) Act, 1934, is to raise the index to 117. Fat sheep, at an average of 9½d. per lb. for second quality, were unaltered both in price and index. Compared with July, quotations for bacon pigs appreciated from 11s. 3d. to 11s. 5d., and those for pork pigs from 11s. to 11s. 4d. per score (20 lb.). The index for the former at 111 is lower by 2 points on account of the rise in price having been slightly greater between the corresponding months of 1931-13; that for porkers rises from 106 to 107.

Dairy cows and store cattle were a little cheaper, but only in the case of dairy cows is the index lower, by 1 point to 103. Quotations for store sheep were higher and the index advances from 113 to 126. Store pigs also were dearer and show a rise of 7 points in their index to 133.

Dairy and Poultry Produce. The index of the regional contract price of milk is unchanged at 175. Butter at an average of 1s. 1d. per lb. was higher by 1d.; this increase, however, was counterbalanced by a similar rise in the base period, and the index remains at 100. Eggs at 14s. 4d. per 120 compared with 12s. 1d. in the previous month, and the index appreciates from 123 to 130. The rise of 2s. per cwt. in the price of cheese is not reflected in the index, which at 113 is the same as for July. Quotations for most descriptions of poultry declined, the combined index falling by 4 points to 113.

Other Commodities. Prices for first early potatoes, which are used in compiling the potato index for July and August, showed a considerable fall in the second month, the average

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of £4 8s. od. per ton being lower by £3 6s. 6d. The index is reduced by 30 points to 109. On the other hand, both clover and meadow hay advanced in price, the combined index moving from 82 to 98. At 1s. 0½d. per lb. wool was dearer by ½d., and the index at 95 is higher by 1 point.

Monthly Index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity	1934	1935	1936			
	Aug.	Aug.	May	June	July	Aug.
Wheat ..	64	60	84	84	86	96
Barley ..	123	103	105	92	84	100
Oats..	92	92	82	82	83	98
Fat cattle ..	106	92	94	98	100	102
„ sheep ..	128	114	130	131	128	128
Bacon pigs ..	103	98	113	119	113	111
Pork „	108	97	108	112	106	107
Eggs ..	119	133	109	114	123	130
Poultry ..	116	115	121	124	117	113
Milk..	168	175	162	162	175*	175
Butter ..	92	92	96	98	100	100
Cheese ..	96	85	103	108	113	113
Potatoes ..	153	137	174	160	139	109
Hay..	101	101	82	83	82	98
Wool ..	87	89	96	94	94	95
Dairy cow...	104	102	101	103	104	103
Store cattle..	85	89	96	96	101	101
„ sheep..	104	111	107	119	113	126
„ pigs ..	139	118	118	122	126	133

Revised index numbers due to payments under the Wheat Act and the Cattle Industry (Emergency Provisions) Act.

Wheat ..	108*	114*	115*	115*	112*	122
Fat Cattle ..	..	107	107	111	114	117
General Index ..	122*	120	120	121	121*	124

* Superseding figures previously published.

Scholarships for the Sons and Daughters of Agricultural Workmen and Others

THE selection of candidates for this year's awards under the Ministry's scheme of scholarships for the sons and daughters of agricultural workmen and others, has now been completed. The total number of applications received was 627, and 134 scholarships have been awarded. These awards were allocated as follows:—

Ten Senior Scholarships tenable at university departments

MISCELLANEOUS NOTES

of agriculture or agricultural colleges for degree or diploma courses in an agricultural subject; 14 Extended Junior Scholarships, not exceeding one year in duration, for advanced or specialized courses of instruction at farm institutes or agricultural colleges; and 110 Junior Scholarships tenable at farm institutes and similar institutions, for courses not exceeding one year in agriculture, horticulture, dairying or poultry husbandry, or in a combination of two of these subjects.

The following obtained Senior scholarships :—

For Degree Courses :

HANNAH E. BEVAN (Monmouthshire Institute of Agriculture) to Reading University.

JOHN R. JUDSON (Cumberland and Westmorland Farm School) to Armstrong College, Newcastle-on-Tyne.

JOHN H. KITCHIN (Hertfordshire Institute of Agriculture) to Reading University.

MARJORIE E. MIXTER (East Anglian Institute of Agriculture) to Reading University.

MARGARET NORRIS (Brigg Girls' High School) to The Horticultural College, Swanley.

WILLIAM J. A. PAYNE (Prince Henry's Grammar School, Evesham) to Downing College, Cambridge.

MARGARET N. B. WILSON (Letchworth Grammar School) to The Horticultural College, Swanley.

For Diploma Courses :

GEORGE A. GOWLAND (Northamptonshire Institute of Agriculture) to Leeds University.

MARGARET HOLLAND (Monmouthshire Institute of Agriculture) to Harper Adams Agricultural College.

RAY C. WATERS (Midland Agricultural College) to return to The Midland Agricultural College.

Empire Primary Producers' Tour, 1936-37.—The 14th tour organized by the British National Union will include a visit to India and Ceylon. These tours have as an object the promotion of friendly and mutually beneficial relations between primary producers throughout the British Empire. The forthcoming tour has been arranged to take place during the winter months, when the climate of India is at its best, and will combine visits to important centres of agricultural and primary production, as well as to places of historic interest. The date of departure from London has been fixed for December 18, 1936, per S.S. *Corfu* (15,000 tons), leaving Southampton on the following day. The outward route will be via Tangier, Gibraltar, Marseilles (December 25), Malta, Suez Canal, Aden to Bombay (January 7, 1937). The tour will cross India by special train through Central and Northern India, as far as the Khyber Pass, returning via Calcutta and Darjeeling, visiting various points of interest en route; finally, southwards, via Madras, to Ceylon, where a week will be spent. The party will return from Colombo on March 3, by the S.S. *Christian Huygens* (16,000 tons), via Genoa and Villefranche (Nice) to Southampton (March 22). The cost of the entire tour, including transportation, servants in India,

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meals, hotel accommodation where necessary, special train and excursions, has been fixed at £295 (sterling) first-class throughout, and £259 (sterling) second-class on ship only. An illustrated brochure containing full particulars, itinerary, dates, etc., may be obtained on application to Major-General F. J. Duncan, Organizing Secretary, The British National Union (Inc.), 9, Arlington Street, London, S.W.1.

Foot-and-Mouth Disease. An outbreak of Foot-and-Mouth Disease was confirmed on September 6 at Nuthurst, Horsham, West Sussex. The usual restrictions were imposed over an area in East and West Sussex and Surrey of approximately 15 miles radius round the infected premises. This is the first outbreak of the disease in Great Britain for over seven months, the last confirmed outbreak being on January 26.

An order was issued contracting the Infected Area to approximately five miles round Nuthurst as from September 21, and, provided the disease position remains satisfactory, the area will be finally freed from Foot-and-Mouth disease restrictions as from September 28.

Farm Workers' Minimum Rates of Wages.—A meeting of the Agricultural Wages Board was held at King's Buildings, Smith Square, London, S.W.1, on Tuesday, September 22, 1936, The Rt. Hon. the Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages, and proceeded to make the following Orders :

Gloucestershire.—An Order fixing minimum and overtime rates of wages to come into force on October 5, 1936 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until October 3, 1937. The minimum rates for male workers of 21 years of age and over are as follows : (a) head carters, 36s. 6d. (instead of 35s. 6d.) per week of 58 hours in summer, except in the weeks in which Good Friday and Whit Monday fall, when the hours are 51, and 38s. (instead of 37s.) per week of 60 hours in winter, except in the week in which Christmas Day falls, when the hours are 52½; (b) head shepherds and head stockmen, 38s. (instead of 37s.) per week of 60 hours, except in the weeks in which Christmas Day, Good Friday and Whit Monday fall, when the hours are 52½; (c) under carters, 34s. 6d. (instead of 33s. 6d.) per week of 54 hours in summer, except in the weeks in which Good Friday and Whit Monday fall, when the hours are 48, and 36s. 6d. (instead of 35s. 6d.) per week of 57 hours in winter, except in the week in which Christmas Day falls, when the hours are 50½; (d) under shepherds and under stockmen, 36s. 6d. (instead of 35s. 6d.) per week of 57 hours, except in the weeks in which Christmas Day, Good Friday and Whit Monday fall, when the hours are 50½; and (e) other male workers, 32s. (instead of 31s.) per week of 50 hours in summer, except in the weeks in which Good Friday and Whit Monday fall, when the hours are 41, and 48 hours in winter, except in the week in which Christmas Day falls, when the hours are 39½. Provision is made for an adjustment of the hours in respect of which the minimum rate is payable in the week preceding Whitsun week to meet cases where a holiday is given in that week instead of in the week in which Whit Monday falls. The overtime rates for all male workers of 21 years of age and over are unchanged at 9d. per hour on weekdays and 11d. per hour on Sundays, Christmas Day, Good Friday and Whit Monday. For female workers of 18 years of age and over, the minimum rate remains unchanged at 5d. per hour.

Lincolnshire (Holland).—An Order fixing minimum and overtime rates of wages to come into force on October 25, 1936 (i.e., the day following

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that on which the existing rates are due to expire), and to continue in operation until October 30, 1937. The minimum rates for male workers of 21 years of age and over are 35s. per week of 48 hours in winter, except in the week in which Christmas Day falls, when the hours are 39 $\frac{1}{2}$, and 50 hours in summer, except in the weeks in which Easter Monday, Whit Monday and August Bank Holiday fall, when the hours are 41. For horsemen, cattlemen and shepherds of similar age, inclusive weekly sums are fixed to cover all time worked in excess of the number of hours mentioned above, except employment which is to be treated as overtime employment. The overtime rates for male workers of 21 years of age and over are 10 $\frac{1}{2}$ d. per hour on Saturdays (or on any other day agreed as the weekly short day), 1s. 1 $\frac{1}{2}$ d. per hour on Sundays and on Christmas Day, 8 $\frac{1}{2}$ d. (instead of 8d. as at present) per hour on Easter Monday, Whit Monday and August Bank Holiday, and 9d. per hour for all other overtime employment. The minimum rate for female workers of 15 years of age and over is 6d. per hour, with overtime at 7d. per hour for all employment in excess of 5 $\frac{1}{2}$ hours on Saturday or other agreed weekly short day, on Sundays, and in excess of 8 hours on any other day.

Oxfordshire.—An Order cancelling the existing minimum and overtime rates of wages and fixing fresh rates in substitution therefor to come into force on September 27, 1936 and to continue in operation until October 3, 1937. The minimum rates for male workers of 21 years of age and over are 32s. 6d. (instead of 31s. 6d. as at present) per week of 50 hours in summer, except in the weeks in which Good Friday, Easter Monday, Whit Monday and August Bank Holiday fall, when the hours are 41, and 48 hours in winter, except in the week in which Christmas Day and Boxing Day fall, when the hours are 31, with overtime throughout the period at 10d. (instead of 9 $\frac{1}{2}$ d. as at present) per hour, on weekdays and 1s. (instead of 11 $\frac{1}{2}$ d. as at present) per hour on Sundays, Good Friday, Easter Monday, Whit Monday, August Bank Holiday, Christmas Day and Boxing Day. The minimum rates for female workers of 18 years of age and over remain unchanged at 6 $\frac{1}{2}$ d. per hour, with overtime at 8d. per hour on weekdays and 9 $\frac{1}{2}$ d. per hour on Sundays, Good Friday, Easter Monday, Whit Monday, August Bank Holiday, Christmas Day and Boxing Day.

Pembroke and Cardigan.—An Order fixing minimum and overtime rates of wages to come into force on October 1, 1936 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until September 30, 1937. The minimum rate for male workers of 21 years of age and over is 31s. (as at present) per week of 52 hours in winter and 54 hours in summer, with overtime unchanged at 8d. per hour. For female workers of 18 years of age and over, the minimum rate remains unchanged at 5d. per hour for 8 hours per day throughout the year with overtime payment on weekdays, at 6d. per hour and on Sundays at 6 $\frac{1}{2}$ d. per hour for the first three hours and 7 $\frac{1}{2}$ d. per hour for subsequent hours.

Radnor and Brecon.—An Order continuing the operation of the existing minimum and overtime rates of wages from November 1, 1936 (i.e., the day following that on which the existing rates are due to expire) until April 30, 1937. The minimum rates for male workers of 21 years of age and over are 31s. per week of 50 hours in winter and 54 hours in summer, with overtime at 9d. per hour. For female workers of 18 years of age and over, the minimum rate is 5d. per hour with overtime at 6 $\frac{1}{2}$ d. per hour on weekdays and 7 $\frac{1}{2}$ d. per hour on Sundays.

MISCELLANEOUS NOTES

Enforcement of Minimum Rates of Wages.—During the month ending September 13, 1936, legal proceedings were taken against seven employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

Committee Area	Court	Fines Imposed	Costs Allowed	Arrears of Wages ordered	No. of workers involved
Cornwall ..	St. Ives ..	£ 4 0 0	—	£ 46 0 4	4
Derby ..	Wirksworth ..	5 0 0	0 4 0	9 10 0	1
" ..	Derby ..	*	0 8 0	40 0 0	1
Monmouth ..	Cross Ash ..	*	—	2 13 6	1
Notts ..	Nottingham ..	1 1 0	—	15 0 0	1
Yorks, W.R.	Sherburn-in-Elmet ..	1 0 0	0 2 6	22 14 8	1
Glamorgan ..	Cowbridge ..	0 5 0	0 5 0	37 8 9	1
		II 6 0	0 19 6	173 7 3	10

* Dismissed under Probation of Offenders Act.

Agricultural Returns of England and Wales, 1936 : Acreage of Hops

PRELIMINARY STATEMENT compiled from the Returns collected on June 4, 1936, showing the ACREAGE under HOPS in each COUNTY OF ENGLAND in which HOPS were grown, with a COMPARATIVE STATEMENT for the Years 1935 and 1934.

Counties, etc.			1936	1935	1934
			Acres	Acres	Acres
Kent ..	East .. ..	..	1,890	2,051	2,097
	Mid .. ..	..	2,980	2,969	2,862
	Weald .. ..	..	5,020	5,122	5,050
	TOTAL, Kent ..		9,890	10,142	10,009
Hants ..	.. .. ..	..	470	573	583
Hereford ..	.. .. ..	..	3,990	3,998	4,016
Surrey ..	.. .. ..	..	120	110	93
Sussex ..	.. .. ..	..	1,590	1,462	1,420
Worcester ..	.. .. ..	..	1,890	1,901	1,851
Other Counties ..	.. .. ..	..	80	65	65
	TOTAL		18,030	18,251*	18,037*

* These figures include the acreage left unpicked which was estimated in 1935 to be about 632 acres and in 1934 about 270 acres.

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APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS: ENGLAND

Cornwall: Mr. R. Gardner, N.D.H., has been appointed Head Gardener and Instructor at the Gulval Experimental Station, *vice* Mr. H. W. Sayer.

Hertfordshire: Mr. W. M. Gair has been appointed Poultry-keeping Instructor, *vice* Mr. D. W. Ferguson.

Kent: Mr. R. Hart, N.D.H., N.D.A., N.D.D., has been appointed Principal of Borden Farm Institute, *vice* Mr. T. W. McDougall-Porter, M.C., N.D.A.

Mr. J. B. Duggan, N.D.H., has been appointed Instructor in Commercial Fruit Growing, *vice* Mr. R. Hart.

Mr. E. Middleton has been appointed Recorder of Egg Laying Trials, *vice* Mr. K. A. Clark.

COUNTY AGRICULTURAL EDUCATION STAFFS: WALES

Monmouthshire: Miss M. A. Price, B.Sc., has been appointed Assistant Instructor in Rural Domestic Economy.

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The Tithe Act, 1936. By E. Lawrence Mitchell, C.B.E. Pp. 36. (London : Published jointly by the Land Agents' Society, the Central Land-owners' Association and the Chartered Surveyors' Institution. 1936. Price 1s. 6d.)

This brochure is a reprint of an article by the Secretary of the Royal Commission on Tithe Rentcharge, which appeared in a recent issue of *The Journal of the Land Agents' Society*. The salient features of the new measure are explained, and there is a table for calculating the amount of a redemption annuity in respect of tithe rentcharge. Land and tithe owners and other persons affected by the Act will find this a useful and authoritative guide to its provisions.

The History of Milk Prices: an Analysis of the Factors affecting the Prices of Milk and Milk Products. By Ruth L. Cohen. Pp. xiii + 205. (Oxford : Agricultural Economics Research Institute. 1936. 5s.)

In this book, Miss Cohen gives a history of the milk market in England from pre-war times to the present day. She traces the course of milk and milk-product prices since 1906, and analyses the growth of the import trade in dairy products from 1886 onwards. She discusses the changes in production at home and abroad, and attempts to determine the relative influence of supply and demand on the course of prices. She does not discuss in detail the economics of the retail distribution of milk and milk products, but, with this limitation, her study is the most complete that has yet appeared.

During the pre-war period, consumption of liquid milk was expanding; between 1890 and 1907-08 there was an increase of over 50 per cent. in total consumption and of 33 per cent. in consumption per head. Retail prices in London (the only series available) remained stable from 1892 to 1915 at 1s. 4d. per gallon (though 1s. 8d. was also paid in the winter of 1911-12). Increased production of liquid milk was associated with a decline in home production of butter and cheese and a large increase in imports of these products, especially of butter.

In the post-war period, the increase in consumption of liquid milk per head was much slower, and the retail price was high relatively to retail prices in general. Since total dairy production was increasing, the production of milk products increased relatively to that of liquid milk. At

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the same time, imports of butter increased even more rapidly than before the war. The chief innovation in the post-war organization of the market was, of course, the introduction of the collective bargaining system for the determination of producers' prices, and the resulting differentiation between the prices payable for milk sold to the liquid market and that destined for manufacture.

As regards the relative profitability of sale to the liquid market and of conversion to butter or cheese, however, Miss Cohen finds that there was no substantial difference in favour of liquid milk, either before the war or after it, up to 1929, for farmers between 100 and 150 miles from London. This is the zone where the most important butter and cheese producing areas close to London are to be found. Average figures for the country as a whole, published by the Reorganization Commission (p. 43 of their report), showed a difference in favour of liquid milk of nearly 4d. per gallon in 1913 and of nearly 6d. in 1922-3. In an area, however, where production of liquid milk and conversion to butter and cheese go on side by side, a permanent difference of any magnitude would be inexplicable as long as individual farmers retained their freedom to dispose of their milk in the most profitable way. Miss Cohen concludes, therefore, that, up to 1929, the collective bargaining system probably did not operate to raise artificially the level of liquid as compared with manufacturing prices. When, after 1929, it attempted to maintain the contract price of liquid milk in spite of the fall in butter and cheese prices, the level of liquid prices and the continuance of organized bargaining itself were alike jeopardized by the danger of a large-scale diversion of milk from the manufacturing to the liquid market.

Miss Cohen agrees that some form of intervention was justified at this stage, for, the industry having been expanded in the years since 1929 by the maintenance of liquid prices, the disappearance of organized marketing would have meant a disastrous fall in prices, sufficient perhaps to threaten a subsequent shortage of milk. But the marketing scheme as it has been operated does not escape her criticism. Retail prices, she finds, have been raised to some extent, more especially in the smaller towns and rural districts, and the increase in consumption has been thereby checked. With the present consumption of liquid milk, pool prices are probably well above the level necessary to maintain an adequate supply. "It is not right that the production of milk to be made into factory cheese at home should be permanently subsidized by paying farmers at least 4d. per gallon more for their milk than it can realize in this outlet." Under present conditions, an increase in efficiency in the overseas countries might even lead to an increase in liquid prices, for the Board might be tempted to increase liquid prices in order to counteract the effects of a fall in the price of manufactured products. Further, the pooling arrangements and the regulations as to transport deductions are likely to encourage an uneconomical geographical distribution of the industry, involving the transport of liquid milk for unnecessary distances.

The story is, of course, in its main outlines a familiar one, but Miss Cohen's material is more comprehensive and her analysis more thorough than any hitherto available. The book will take its place as one of the essential works on the subject.

An Outline of Malayan Agriculture. By D. H. Grist. Pp. xiii + 377, 2 Maps and 86 Figs. (Kuala Lumpur, Straits Settlements : Department of Agriculture, 1936. Price 7s.)

The practice of Malayan agriculture is not a subject that is likely to be of immediate practical service to farmers of Great Britain, but so much has been heard of the troubles which affect the growers of rubber, tobacco

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and coffee, as well as other tropical and sub-tropical crops, that a consideration of their methods will reflect some degree of similarity with the economic difficulties that confront farmers all over the world in these troublous times. A former handbook of Malayan agriculture was prepared in 1922 and revised in 1924, but owing to difficulties in which the planters and farmers of Malay found themselves, very extensive changes and developments have taken place since that date; and the present treatise is intended to describe the condition of the country in 1935. The major crops, rubber, coconuts, rice, oil palm, pineapples, are treated in detail and the Malayan minor crops in a general manner. Cattle, pigs and poultry form the subject of separate chapters, and the whole is introduced by a section dealing with agricultural conditions, including chapters on land tenure, policy and co-operation of the organization of the various agricultural services. The book should be in the hands of all planters and farmers of Malaya, and will form a very useful work for anyone engaged in the study of tropical agriculture. An additional advantage is that each chapter is supplied with a bibliography for those who wish to pursue their inquiries further.

Agricultural Organization in New Zealand. A Survey of Land Utilization, Farm Organization, Finance and Marketing. By H. Belshaw, Director of Project; D. O. Williams, Joint Editor and Acting Director; F. B. Stephens, Research Assistant; E. J. Fawcett and H. R. Rodwell, Associate Editors. Pp. xx + 818. 21 Maps. (London: Humphrey Milford, Oxford University Press. 1936. Price 21s.)

It would be quite impossible to give a comprehensive survey of this work in the course of a brief notice. It will be sufficient, however, to indicate the value of this contribution by stating its origin and giving a concise summary of its contents. The book is one of a number of surveys in land utilization in various Pacific countries, authorized by the Research Committee of the New Zealand Institute of Pacific Relations. The work has been done by the joint efforts of some thirty specialists, whose work had been carefully planned and correlated over a number of years. It is thus not simply a collection of separate essays, but presents a co-ordinated examination of the foundation, methods and problems of the farming industries in New Zealand and public policy in relation to them.

In planning the book, a broad view of the problem of land utilization has been adopted. The technique of land utilization is conditioned by a wide variety of factors, such as land tenure, transport, markets, price movements, organizations, associations and institutions, as well as by conditions of soil, climate, topography and the stage of development of the agricultural arts. Because of their bearing on land utilization, the above and other problems, which may be grouped broadly under the general heading of organization, have been dealt with as adequately as possible.

Broadly, the book is divided into four main headings: 1, Introductory; 2, General factors affecting land utilization in New Zealand; 3, Organization of Farming; 4, Processing and Marketing. Under each of these heads a number of essays by specialists in particular departments is included, the general nature of which has already been indicated.

The publishers claim that the volume is the only authoritative and comprehensive survey of land utilization and agricultural organization which has so far been attempted in New Zealand, and, from that point of view alone, it is essential to the understanding of the development of the present position of agriculture in that country.

WIRELESS TALKS TO FARMERS, OCTOBER, 1936

<i>Station and Date</i>	<i>Time : p.m.</i>	<i>Speaker</i>	<i>Subject</i>
National : October 5, 12, 19 and 26	6.20	Mr. Anthony Hurd	Seasonal.
North : October 2	7.30	Mr. W. B. Mercer, Principal of the Cheshire School of Agriculture	A Survey of the South-western part of the Region
October 9	6.40	Mr. H. E. Brooks, Newton Rigg Farm School	Gardening for Profit : Small Fruit.*
October 15	7.55	Mr. B. H. Wilson (Director of Research, Wool Industries Association, Leeds) and Sir David Rivett	Work in Progress : Wool Research.
October 16	8.40	Mr. A. McVicar, Agricultural Organizer for Lindsay, Lincolnshire	A Survey of North Nottinghamshire, Lincolnshire and the East Riding of Yorkshire.
Midland : October 11	5.50	Mr. Graham Castle	Our Country Correspondent, Gloucestershire.
October 15	6.40	Messrs. W. B. Thompson and R. B. Collier	Dried Grass and its Use.
West : October 8, 22	6.40	Mr. A. W. Ling	For Western Farmers in particular.
Scottish : October 8	6.25	Mr. A. D. Buchanan Smith	Influence of the Proven Sire.
October 9	9.0	A townsman, a blacksmith, a schoolmaster, and a retired farm labourer	The Everlasting Heritage† : The Land and the People—Discussion.
October 15	6.30	Mr. R. L. Scarlett	For Scottish Farmers.
October 22	6.40	Mrs. Blair	The Farm Kitchen.
October 23	Not fixed	Sir John Boyd Orr and Mr. Harry J. Rae	The Everlasting Heritage† : The Health of the Nation.
October 29	6.30	Not fixed	For Scottish Farmers.
Northern			
Ireland : § Fortnightly on Fridays	7.30	Mr. Peter Fitzpatrick	Farmers' Work and Worry.

* The Northern station is broadcasting an experimental series of talks on commercial horticulture, for the benefit of smallgrowers, under the title of "Gardening for Profit." Each talk will be given by an expert, and in the first talk on October 9, at 6.40 p.m., H. E. Brooks, Head of the Newton Rigg Farm School, Penrith, Cumberland, will discuss "Small Fruit."

† "The Everlasting Heritage" is an important series of talks to be given from the Scottish studio, and which should be of considerable interest, not only to the Scottish farming community, but to many others on this side of the Border, for the problems to be discussed are those which affect all parts of the country. The main scheme of the series has been drawn up by Ian Macpherson, author of "Land of Our Fathers," and John R. Allan, author of "Farmer-Boy," and in it the relations between town and country will be fully explored.

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An anonymous inquirer, faced with these problems in the opening programme, will, in five successive ones, interview various experts and witnesses on the subjects of agricultural methods, land settlement, urban and rural population, and public health. In the first broadcast on October 9 the subject will be "The Land and the People," and the discussion will be between a townsman, a blacksmith, a schoolmaster, and a retired farm labourer. The second on October 23 will deal with the "Health of the Nation," as it affects both town and country, and will be given by Sir John Boyd Orr and Harry J. Rae, Medical Officer for Aberdeenshire.

§ There will also be a monthly talk by members of the Ministry of Agriculture for Northern Ireland, details of which will be available later.

Market Prices Bulletins. The B.B.C. announces that, in co-operation with the Ministry, the arrangements for the issue of Market Prices for Farmers have been altered.

Henceforward, only one General Bulletin for Farmers will be broadcast in the National programme each week at 6.20 p.m. on Fridays.

On the other hand, the number of local Market Prices Bulletins will be increased, and will be broadcast in the Regional programmes at 7.20 p.m., as under :—

Scotland .. .	Tuesdays, Wednesdays, Thursdays and Fridays.
Northern Ireland .. .	Mondays, Tuesdays, Wednesdays, Thursdays and Fridays.
North of England .. .	Mondays, Tuesdays, Wednesdays, Thursdays and Saturdays.
Midland .. .	Tuesdays, Wednesdays, Thursdays and Saturdays.
London and Home Counties .. .	Tuesdays, Wednesdays, Fridays and Saturdays.
Wales .. .	Tuesdays and Fridays.
West of England .. .	Mondays and Thursdays.

SELECTED CONTENTS OF PERIODICALS

Agriculture, General and Miscellaneous

Scientific Progress in Agriculture. *F. L. Engledow.* (J. Chart. Surv. Instn. 16, 1 (July, 1936), pp. 13-39.)

Changes in the Agricultural Industry of Aberdeenshire in the Last Fifty Years. II. *J. Cruickshank.* (Scot. J. Agric. 19, 3 (July, 1936), pp. 225-239.)

The Case for Land Improvement and Reclamation. *R. G. Stapledon.* (J. Roy. Soc. Arts, 84, 4367 (31 July, 1936), pp. 971-994.)

The Economics of Rural Landowning. *W. C. D. Dampier-Whetham.* (J. Proc. Agric. Econ. Soc. 1, 3 (Dec., 1930), pp. 56-75.)

Tchécoslovaquie.

La Coopération agricole. *A. Hulka.* (L'Est Européen Agric. 17 (April, 1936), pp. 105-127.)

Mechanization in British Farming. *S. J. Wright.* (Emp. J. Exp. Agric. (July, 1936), pp. 283-288.)

Rural Migration. *W. H. Jones* and *J. R. E. Phillips.* (Welsh J. Agric. 12 (Jan., 1936), pp. 5-22.)

Migration and Settlement in Australia, New Zealand and Canada. *D. C. Tait.* (Inter. Lab. Rev. 34, 1 (July, 1936), pp. 34-65.)

Sir John Sinclair. *A. M'Callum.* (Scot. J. Agric. 19, 3 (July, 1936), pp. 215-225.)

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A New Method of Arranging Variety Trials Involving a Large Number of Varieties. *F. Yates.* (J. Agric. Sci. 26, 3 (July, 1936), pp. 424-455.)

The International Organisation of the Sugar Market. *F. Arcoleo.* (Int. Rev. Agric. Mon. Bull. Agric. Econ. Soc. (June, 1936), pp. 171-186.)

Agricultural Economics

Farm Economics in Scotland: The Value of a Type-Classification of Holdings. *W. H. Senior.* (Scot. J. Agric. 19, 3 (July, 1936), pp. 258-264.)

Causes of the Fall of Agricultural Prices between 1875-1895. *H. M. Conacher.* (Scot. J. Agric. 19, 3 (July, 1936), pp. 239-247.)

Comparative Productivity and Income Yield of Small Holdings. *J. P. Howell.* (Welsh J. Agric. 12 (Jan., 1936), pp. 46-58.)

The Financial Results of Different Types of Farms in Wales. *J. P. Howell.* (Welsh J. Agric. 12 (Jan., 1936), pp. 22-46.)

Farm Aid in Foreign Countries. (Foreign Crops and Markets, 32, 22 (June 1, 1936), pp. 643-684.)

Soils and Fertilizers

The Determination of Phosphorus in Soils. *W. McLean.* (J. Agric. Sci. 26, 3 (July, 1936), pp. 331-336.)

Further Studies on the Aspergillus Niger Method of Examining Soils. *A. M. Smith.* (J. Soc. Chem. Indus., Lond., 55, 31 (July 31, 1936), pp. 217T-221T.)

The Effect of Applying a Nitrogenous Fertiliser to Wheat at Different Stages of Growth. *D. J. Watson.* (J. Agric. Sci. 26, 3 (July, 1936), pp. 391-414.)

Some Minor Fertiliser Materials. (Bull. Imp. Inst., London, 34, 2 (April-June, 1936), pp. 212-219.)

Plant Pests, Diseases, etc.

A Strawberry Disease Resembling the American "Crimp." *L. Ogilvie and C. R. Thompson.* (Ann. Rept. Agric. and Hort. Res. Stn., Long Ashton (1935), pp. 77-79 + 1 pl.)

The Control of Woolly Aphis (*Eriosoma Lanigerum*, Hausm.) on Nursery Trees. *H. G. H. Kearns and E. Umpleby.* (Ann. Rept. Agric. and Hort. Res. Stn., Long Ashton (1935), pp. 67-75 + 1 pl.)

Recherches sur le comportement du carpocapse en vue de l'établissement rationnel des traitements insecticides dirigés contre cet insecte. *M. P. Marchal.* (C. R. Acad. Agric., France, 22, 22 (July 8, 1936), pp. 783-788.)

The Control of Flea Beetles by Means of a Seed Dressing. Progress Report. *C. L. Walton.* (Ann. Rept. Agric. and Hort. Res. Stn., Long Ashton (1935), pp. 80-86.)

Studies on the Resistance and Immunity of Apples to the Woolly Aphid, *Eriosoma Lanigerum* (Hausm.). *M. B. Crane, R. M. Greenslade, A. M. Massee and H. M. Tydeman.* (J. Pomol. 14, 2 (July, 1936), pp. 137-163 + 4 pl.)

The Raspberry Beetle (*Byturus tomentosus*) and its Control. *J. Carroll.* (J. Dep. Agric. Irish Free State, 34, 1 (June, 1936), pp. 119-123.)

The Relation of Aphids to the Transmission of Bean Mosaic. *W. J. Zaumeyer and C. W. Kearns.* (Phytopathology, 26, 7 (July, 1936), pp. 614-629.)

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- The Death-Watch Beetle. *R. Palmer.* (*Estate Mag.* 36, 8 (August, 1936), pp. 581-585.)
- Gall Midges affecting Grass Seed Production in Mid-Wales. *D. P. Jones.* (*Welsh J. Agric.* 12 (Jan., 1936), pp. 192-197.)
- The Control of Gall Midges affecting Seed Production in Grasses. *G. Evans and D. P. Jones.* (*Welsh J. Agric.* 12 (Jan. 1936), 198-204.)
- Gall Midges (*Cecidomyidae*) whose Larvæ attack Fungi. *Joan A. T. Anderson.* (*J. S.-E. Agric. Coll., Wye* (July, 1936), pp. 95-107.)
- Three Weevils of the Genus *Rhynchites* Injurious to Fruit. *S. W. Rolfe.* (*J. S.-E. Agric. Coll., Wye* (July, 1936), pp. 86-94.)
- Studies of Impregnation of Tree Banding Materials. II. Apple Blossom Weevil and Codlin Moth Experiments in 1935. *R. M. Greenslade and A. M. Massee.* (*Rep. E. Malling Res. Stn.* (1935), pp. 177-183.)
- A Note on the Treatment of Dormant Nursery Stock against Woolly Aphid. *R. M. Greenslade.* (*Rep. E. Malling Res. Stn.* (1935), pp. 184-185.)
- Observations on Codlin Moth (*Cydia pomonella*, L.) in 1935. *W. Steer.* (*Rep. E. Malling Res. Stn.* (1935), pp. 186-190.)
- Insect Damage to Empire Products. *J. W. Munro.* (*J. Roy. Soc. Arts*, 84, 4365 (July 17, 1936), pp. 925-937.)
- A Fungus Disease of Stored Potatoes. *N. L. Alcock and C. E. Foister.* (*Scot. J. Agric.* 19, 3 (July, 1936), pp. 252-257 + 4 pp. plates.)
- Tomato-seedling Damping-off: Control by Soil Treatment. *R. M. Brien and E. E. Chamberlain.* (*N.Z. J. Agric.* 52, 5 (May 20, 1936), pp. 257-267.)
- Black Rot of Tomato, *Lycopersicum esculentum*, caused by *Alternaria Sp.* *Elsbeth E. Warner.* (*Phytopathology*, 26, 6 (June, 1936), pp. 530-549.)
- Fungi of Sugar Beets. *F. A. Hodges.* (*Phytopathology*, 26, 6 (June, 1936), pp. 550-563.)
- Tulip Diseases: *Sclerotium Tuliparum*, *Botrytis Tulipæ.* (*J. Roy. Hort. Soc.* 61, 8 (August, 1936), pp. 352-353.)
- Experiments on the Use of Lime in Controlling Finger-and-Toe Disease of Brassica. *T. Whitehead.* (*Welsh J. Agric.* 12 (Jan. 1936), pp. 183-192.)
- Stand unserer Kenntnisse vom Löwenmaulrost (*Puccinia antirrhini*, Diet. et Holw.) und seiner Bekämpfung. *H. Pape.* (*Der Forschungsdienst*, 1, 12 (June 15, 1936), pp. 930-938.)
- Notes on the Silver Leaf Disease. *H. Wormald.* (*Rep. E. Malling Res. Stn.* (1935), pp. 155-157 + 1 p. plates.)
- The Verticillium Wilt of Hops. *R. V. Harris.* (*Rep. E. Malling Res. Stn.* (1935), pp. 158-162.)
- The Incidence of Canker in Young Cider-Apple Trees. *E. Umpleby and T. Swarbrick.* (*Ann. Rept. Agric. and Hort. Res. Stn.*, Long Ashton (1935), pp. 98-103.)
- Factors influencing Infection of Barley by Loose Smut. *R. W. Leukel.* (*Phytopathology*, 26, 7 (July, 1936), pp. 630-642.)
- Ein neuer Unkrautpilz auf Champignonbeeten (*Pleurotus Passerarius*, Pilat.). *F. Passecker* (*Z. Pflkrankh.* 46, 6 (1936), pp. 271-277.)
- The Incidence of "Reversion" in Seedling Black Currants and in Clones derived from them. *G. T. Spinks and G. E. Clothier.* (*Ann. Rept. Agric. and Hort. Res. Stn.*, Long Ashton (1935), pp. 58-66.)

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- Bacterial Canker of Plum Trees in Relation to Nutrition : Experimental Results in Sand Cultures. *F. H. Beard* and *H. Wormald*; and Appendix by *W. A. Roach*. (Rep. E. Malling Res. Stn. (1935), pp. 146-154 + 1 p. plate.)
- A Note on the Occurrence of New Virus Diseases of the Tomato in the Bristol Province. *L. Ogilvie*. (Ann. Rep. Agric. and Hort. Res. Stn., Long Ashton (1935), pp. 104-106.)
- Poisonous Plants, with Special Reference to the Poisonous Properties of Bracken (*Pteridium aquilinum*). *K. W. Braid*. (Scot. J. Agric. 19, 3 (July, 1936), pp. 247-251.)
- Mineral Oils as Mosquito Larvicides. *D. R. P. Murray*. (Bull. Ent. Res. 27, 2 (July, 1936), pp. 289-305.)
- The Eradication of Weeds in Cereal Crops by Sulphuric Acid and other Compounds. *G. E. Blackman* and *W. G. Templeman*. (J. Agric. Sci. 26, 3 (July, 1936), p. 368-390.)
- Pyrethrum. *S. G. Jary*. (J. S.-E. Agric. Coll., Wye (July, 1936), pp. 59-66.)
- The Use of Derris Root as an Insecticide. *W. Steer*. (Rep. E. Malling Res. Stn. (1935), pp. 225-227.)
- Some Metallic and Inorganic Compounds used as Weed Killers. (Bull. Imp. Inst., London, 34, 2 (April-June, 1936), pp. 189-211.)
- Chemical Control of Harmful Fungi during Stratification and Germination of Seeds of *Ribes rugosum*. *C. R. Quick*. (Phytopathology, 26, 7 (July, 1936), pp. 694-697.)
- Some Physiological Effects of Oil Sprays upon Deciduous Fruit Trees. *M. W. Black*. (J. Pomol., 14, 2 (July, 1936), pp. 175-202 + 4 plates.)
- Field Trials in 1935 of the Fungicidal and Phytocidal Properties of Certain New Chemical Preparations. *H. B. S. Montgomery*, *M. H. Moore* and *H. Shaw*. (Rep. E. Malling Res. Stn. (1935), pp. 198-203.)
- A Field Spraying Trial of Combined Fungicide-Contact-Insecticide Sprays in 1935. *M. H. Moore* and *H. B. S. Montgomery*. (Rep. E. Malling Res. Stn. (1935), pp. 191-197.)
- Investigations on Egg-killing Washes. The Ovicultural Properties of Lauryl Rhodanate. *H. G. H. Kearns* and *H. Martin*. (Ann. Rep. Agric. and Hort. Res. Stn., Long Ashton (1935), pp. 49-57.)
- Combined Washes. Progress Report. II. Hydrocarbon Oils in Combination with Lime Sulphur and Derris Extracts in Combination with Lime Sulphur. *H. G. H. Kearns*, *R. W. Marsh*, *H. Martin*. (Ann. Rep. Agric. and Hort. Res. Stn., Long Ashton (1935), pp. 37-48.)
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The general layout of the buildings, plant, equipment and construction of the storage chambers of these Research Stations were designed by Mr. J. J. Piqué while on the staff of the Food Investigation Board. He is now established as Technical Adviser on Fruit Storage and on General Food Storage, with offices at Lloyds Bank Chambers, Hobson Street, Cambridge. Mr. Piqué was also responsible for the design of various commercial storage plant for foodstuffs of several thousands of tons capacity.

The Fruit Stores recently constructed for Messrs. COPO Ltd. comprise many improvements not incorporated in other stores. These stores were designed by Mr. Piqué. Fruit Growers intending to erect storage plant should consult him. He has no business agreements with contractors or makers of plant.

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THE JOURNAL OF THE MINISTRY OF AGRICULTURE

Vol. XLIII No. 8 November, 1936

NOTES FOR THE MONTH

British Commonwealth Scientific Conference

THE British Commonwealth Scientific Conference, to which reference was made in the last (October) issue of this JOURNAL, resumed its sessions in London on October 2. The Conference has been principally engaged in reviewing the activities of the various agricultural bureaux or information centres, and certain research work, coming within the scope of the Executive Council of the Imperial Agricultural Bureaux and financed on an inter-Imperial basis. The report, which will be submitted for the consideration of the Governments of the British Commonwealth before publication, covers a wide field and includes recommendations for increasing the effectiveness of the scientific information service provided by the bureaux. The Imperial Institutes of Entomology and Mycology have also been the subject of review, and the establishment of two additional bureaux within the Empire, in dairying and forestry, respectively, has received consideration.

At the dinner given by His Majesty's Government in the United Kingdom on October 7, the Right Hon. W. Ormsby Gore, M.P., (Secretary of State for the Colonies) extended a cordial welcome to the delegates. In 1927 it was his privilege to preside over a Committee that was considering the co-ordination of scientific research carried on in this country by the Government. They had discussed the dissemination of the results of research and the avoidance of unnecessarily duplicated effort. One of the chief difficulties of research workers was concerned with the immense number of scientific journals that came before them. Results must be made readily available to scientific workers. In 1927 delegates of the Empire Governments met in this country at the Imperial Agricultural Conference to consider, among other things, the problems that had been discussed at the present Conference, and from their discussions arose the Imperial Agricultural Bureaux. The speaker recalled the origin of the Conference in a resolution of the Imperial Economic Conference that met in Ottawa in 1932, and more immediately in

NOTES FOR THE MONTH

a recommendation of the Imperial Committee on Economic Consultation and Co-operation that met in London in 1933. This Committee, considering the method by which Empire co-operation in scientific investigation could be effected, suggested that a conference representative of Empire countries should be summoned to formulate a programme of such forms of research as might be conducted on an inter-Imperial basis.

Replying on behalf of the delegates, Major-General A. G. L. McNaughton, C.B., C.M.G., D.S.O., M.C., representing Canada, said the atmosphere of friendly co-operation provided by their hosts had made it easy for them to deal with the problems under consideration. Their task had been to see that the organizations and institutions under review were directed to the practical application of the information that they received. Not the least of the advantages of such conferences was the proof they afforded that it was possible for representatives of countries widely distributed and divergent in conditions and problems, to meet together to resolve their mutual difficulties. The speaker paid a tribute to the sympathetic chairmanship of Sir Charles Howell Thomas, and to the valuable services of the Secretary of the Executive Council of the Imperial Agricultural Burcaux, Sir David Chadwick, C.S.I., C.I.E.

The final session was held on October 8, when the Chairman read the following telegram from His Majesty's Private Secretary, acknowledging the message that had been sent by the Conference: "I am commanded by the King to convey to the members of the British Commonwealth Scientific Conference, His Majesty's sincere thanks for the loyal sentiments and good wishes to which they have given expression at the conclusion of their deliberations."

In his closing speech the Chairman said that the success that had attended the Conference showed that the foundations of inter-Imperial co-operation, as represented by the system of Imperial Agricultural Bureaux, had been well and truly laid. The Conference had affirmed its belief in the value of co-operation in the field of scientific endeavour, and had performed a real service by demonstrating the extent to which difficult and complicated problems might be resolved by frank interchange of views round the table, in an atmosphere of harmony and goodwill, between those who are masters of their subjects.

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Cambridge University Farm : New Buildings

A SCHEME for the rehabilitation of the buildings of the University Farm, Cambridge, and for the erection of new buildings, has been under consideration for some time. It was first proposed as a part of a scheme for the extension of the School of Agriculture and of several of the Science Departments of the University, which was promoted and liberally supported by the International Education Board (Rockefeller Foundation), and was also assisted by grants of £50,000 each from the Treasury and the Empire Marketing Board. Sanction has now been given for a grant of £4,463 for the erection of new experimental piggeries and of an implement shed on the farm, together with the creation of a maintenance fund.

It is anticipated that the rebuilding scheme on the farm will cost, in all, some £12,000.

Diseases of Bees

A CONFERENCE on "Diseases of Bees," under the chairmanship of Sir John Russell, was held at Rothamsted Experimental Station on September 26, 1936.

A paper entitled, "Brood Diseases in England: the Results of a Three Year Investigation," was read by Dr. H. L. A. Tarr. He stated that a number of different brood diseases of the bee existed in England; American foul brood, Addled brood and European foul brood being the most prevalent. He discussed experiments in which it was shown that American foul brood is a distinct disease caused by *Bacillus larvæ*, and that a relatively large inoculum of the spores of this organism obtained from pure cultures is required to produce the disease in healthy colonies of bees. The vegetative cells of this organism produced no disease when introduced in large numbers into healthy colonies. Addled brood was found to be very prevalent, accounting for about 28 per cent. of all specimens of diseased brood received at Rothamsted over a three-year period. He showed that this disease is rather a unique one, being caused by a defective queen. Requeening cured the disease in all cases studied, but the need for further research was emphasized. European foul brood, he said, was a distinct disease, which was probably caused by a small, lanceolate-shaped, non-spore forming organism. The fact that this bacterium would not grow on any of a large variety of specially-prepared media

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under different conditions, made it impossible to state with absolute certainty that it caused the disease. The disease was modified by spraying cultures of the bacteria, occurring as secondary invaders, over the developing brood of recently-infected colonies.

Dr. Guy Morison of Marischal College, Aberdeen, described his experiments on Bee Paralysis. He first defined the disease, describing its symptoms, and compared it with certain other diseases of adult bees. It is significant that he found that bees affected with this disease invariably have small spherical or ellipsoidal bodies inside the cells of the anterior end of the small intestine. These bodies, he believed, might be "inclusion bodies" of the type found in virus diseases of plants and animals: they never occurred in any healthy bees that were examined. The technique employed in demonstrating these bodies was briefly described, and the necessity for further investigation emphasized. Additional information with reference to this disease appeared in the discussion: the possible infectious nature of the disease, whether more than one disease exists under this heading, and the methods of treatment which have been employed in practice were mentioned.

The results obtained by Swiss investigators on brood and adult bee diseases over an extensive period were described in an interesting paper by Dr. Otto Morgenthaler of Berne. With the aid of charts he described the way in which American foul brood had been successfully dealt with in Switzerland. He showed that, in contrast to American foul brood, European foul brood had greatly increased in Switzerland during the past few years, and he emphasized the need for more effective measures to prevent its spread. While American foul brood can be found in Switzerland at almost any time during the brood-rearing season, European foul brood shows a remarkable seasonal occurrence, being extremely prevalent in the spring, frequently disappearing in the autumn, only to return the following spring. The Swiss beekeepers, he said, no longer fear Acarine disease because the Frow treatment has proved uniformly successful in eradicating this disease from infected stocks. On the other hand a remedy for Nosema remains to be discovered, though in Switzerland this disease is not feared as much as previously.

A paper specially prepared for the Conference by Dr. J. I. Hambleton of the United States Department of Agriculture

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was read. This paper described the ravages which American foul brood has made, and is still making, among bee colonies in the United States. In this country the "shaking treatment," which was formerly considered a satisfactory control measure, has been abandoned,* and burning both bees and combs has been resorted to in the hope that the disease may be overcome. At one time it was hoped that formaldehyde-water, formaldehyde-alcohol or gaseous chlorine would prove a satisfactory method of sterilizing combs from stocks affected with American foul brood, but experience has proved that such substances are useless. Recent experiments, carried out in the United States as part of the campaign against American foul brood, have been directed toward breeding a race of bees immune to this disease.

In the discussion Mr. L. Illingworth referred to the formation of "Bee Diseases Insurance Ltd.," a Society registered through the National Farmers' Union," which it is hoped will provide a means of overcoming brood, and eventually adult, diseases of bees in England. Mr. Herrod-Hempsall stated that, in his opinion, brood diseases offered a serious menace to successful bee-keeping in England. Dr. Gregg moved a resolution that the beekeepers should continue their financial support of the brood diseases investigation at Rothamsted: this resolution was carried unanimously.

A detailed report of this Conference is being published, and copies will be obtainable from the Secretary, Rothamsted Experimental Station, Harpenden, Herts.

The Purchase of Poisonous Insecticides, Fungicides, Weedkillers and Dips for Animals, by Professional Farmers and Horticulturists

UNDER the Pharmacy and Poisons Act of 1933 and the Poisons Rules, 1935, professional farmers or horticulturists—that is to say, those engaged in agriculture or horticulture as a trade or business—are in a special position in respect of the purchase of poisonous insecticides, fungicides, dips and weedkillers. The following note, which is not, however, intended as a comprehensive statement of the requirements of the Act and Rules, indicates the procedure to be adopted

* It seems probable that the failure attributed to this procedure is really due to insufficient care being taken by beekeepers, and not, especially in view of Dr. Morgenthaler's results, due to any inherent weakness in the method.

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by the professional farmer or horticulturist in the purchase of some of the more generally used poisons.

(1) In the first place, it may be pointed out that there are three categories of seller with whom the professional may deal:—

A.—*Authorized Sellers of Poisons*—a category confined solely to those who keep chemists' shops.

B.—*Listed Sellers of Part II Poisons*—who comprise horticultural sundriesmen, ironmongers, and other shopkeepers who are registered by the Local Authority for the retail sale of certain of the more commonly used poisons.

C.—*Wholesale or Manufacturing Firms* who are not shopkeepers.

(2) The professional may obtain from any of these sellers the following poisons:—

Arsenical dips and sheep washes.

Calcium and copper arsenates and arsenites as insecticides and fungicides.

Lead arsenate

Nicotine

Mercuric chloride

Mercuric iodide, organic compounds of mercury

Paris green (copper acetoarsenite)

} as insecticides,
fungicides or
seed dressings.

The professional, in purchasing any of these chemicals, must either himself be known to the seller as a person to whom poisons may properly be sold, or produce a certificate to the same effect from some householder known to the seller to be a responsible person of good character. When making a purchase at a shop, the purchaser must sign the Poisons Book, or, if he is ordering by post, provide the seller with an order in writing signed by himself, stating his address, trade or business, the quantity of the article, and the purpose for which it is needed. If he urgently requires the poison and is prevented by some emergency from attending to sign the Poisons Book or send a signed order, he may obtain delivery by ordering the poison by telegram or telephone, provided that within 24 hours he either signs the Poisons Book or provides the order in writing indicated above (penalty for failure to do so—£50).

(3) The professional cannot obtain sodium or calcium cyanide from a listed seller of Part II poisons, but may do so from an authorized seller of poisons (i.e., a chemist's shop) or from a wholesale or manufacturing firm. Again, he must sign the Poisons Book or send a written order as in (2).

(4) Other agricultural and horticultural "poisons"—e.g., formaldehyde or sulphuric acid, can be obtained from any of the sellers indicated in para. (1) without formality.

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(5) Strychnine may no longer be lawfully supplied for any purpose except in the form of a medicine—e.g., it may not be sold for the destruction of vermin.

(6) The Act requires certain precautions in respect of the labelling of poisons and the containers in which they are kept. Where the farmer or horticulturist buys a bulk supply of any poison and then issues it to his employees in other containers, he must see that each container is correctly labelled and that it is sufficiently strong to prevent leakage under ordinary risks. Where a bottle holding 6 pints or under is used, it must be a "poison bottle"—i.e., fluted vertically with ribs or grooves so as to be recognized by touch. Such procedure as the keeping or issue to employees of nicotine in beer bottles, or lead-arsenate powder in paper bags, is illegal, and by so doing the farmer will render himself liable to heavy penalties.

(7) It is unlawful for any person knowingly to transport certain poisons, among them being arsenical poisons, barium salts, hydrocyanic acid, cyanides and nicotine, in any vehicle in which food is being transported, unless the food is carried in a part of the vehicle effectively separated from that containing the poison, or is otherwise adequately protected from the risk of contamination.

(8) A fuller explanation of the requirements of the Act and Rules affecting farmers or horticulturists is to be found in the Home Office memorandum "Poisons No. 4 (Agriculture and Horticulture)," which may be purchased directly from H.M. Stationery Office at the following addresses:—

Adastral House, Kingsway, London, W.C.2; 120, George Street, Edinburgh, 2; York Street, Manchester, 1; 1, St. Andrew's Crescent, Cardiff; 80, Chichester Street, Belfast; or through any bookseller. Price, 2d. net (2½d. with postage).

The Purchase of Poisonous Insecticides, Fungicides and Weedkillers, by Amateur Gardeners

UNDER the Pharmacy and Poisons Act of 1933, and the Poisons Rules, 1935, amateur gardeners or horticulturists—i.e., those not engaged in growing plants as a trade or business—are in a different position from the professional in respect of the purchase of poisonous insecticides and fungicides. The following note, which is not intended to be comprehensive, indicates the procedure that must be observed by the amateur in obtaining certain of the more generally used horticultural poisons.

NOTES FOR THE MONTH

(1) Under the Act, retail sellers of these poisons are divided into two categories:—

A.—*Authorized Sellers of Poisons*—a category confined solely to those who keep chemists' shops.

B.—*Listed Sellers of Part II Poisons*—who comprise horticultural sundriesmen, ironmongers and other shopkeepers who are registered by the Local Authority for the retail sale of certain of the more commonly used poisons.

(2) The amateur may obtain the following insecticides and fungicides *only from a chemist's shop*:—

Mercuric chloride and other mercuric substances; sodium arsenite and arsenical weedkillers; sodium and potassium cyanide.

When purchasing these poisons the purchaser must sign the "Poisons Book" of the seller. Moreover, if the purchaser is not known to the seller to be a person to whom poisons may properly be sold, he must produce a certificate to this effect, signed by a householder known to the seller as a responsible person of good character.

(3) The amateur may obtain either from a chemist's shop or the shop of a listed seller of Part II poisons, the following poisons:—

Barium silico-fluoride; calcium arsenate; lead arsenate; nicotine; Paris green (copper acetoarsenite).

When purchasing any of the above poisons, the purchaser must sign the "Poisons Book" and be known to the seller as indicated in the previous paragraph.

(4) It should be noted that the amateur cannot purchase by post any of the poisons of which the sale involves the signing of the Poisons Book.

(5) Most of the other poisons likely to be required by the amateur—e.g., barium carbonate in rat poisons, sodium fluoride, formaldehyde, and caustic soda—may be obtained either from a chemist's shop or the shop of a listed seller of Part II poisons without formality, and, in such instances, he may purchase by post.

(6) A fuller explanation of the requirements of the Act and Rules affecting amateur horticulturists is to be found in the Home Office memorandum "Poisons No. 4 (Agriculture and Horticulture)," which may be purchased directly from H.M. Stationery Office at the following addresses:—

Adastral House, Kingsway, London, W.C.2; 120, George Street, Edinburgh, 2; York Street, Manchester, 1; 1, St. Andrew's Crescent, Cardiff; 80, Chichester Street, Belfast; or through any bookseller. Price, 2d. net (2½d. with postage).

NOTES FOR THE MONTH

The Problem of Nutrition*

To the three volumes under the above title, noticed in the issue of this JOURNAL for September last (p. 514), a fourth volume has now been added. This last contains a wealth of statistical data relating to the production, consumption, and wholesale and retail price movements of a number of protective and other foodstuffs. The volume was specially prepared by the International Institute of Agriculture, whose Year Book of Agricultural Statistics has hitherto lacked the data concerning food consumption, which have now been so usefully collected. It is to be hoped that future Year Books will regularly include current information upon this important aspect of agricultural statistics.

The provisional and unsatisfactory nature of many of the estimates of production and consumption is emphasized in the introduction to the volume, and one of the important services which it will almost certainly render will be to draw attention to these deficiencies in the field of food-consumption statistics and lead the competent authorities to secure an improvement.

Imperial Agricultural Bureaux: Executive's Report

THE Executive Council of the Imperial Agricultural Bureaux is a unique organization in the Empire, being composed of representatives of the Dominions and Colonies that contribute to the support of the Bureaux. It exercises a direct executive control over the eight Imperial Agricultural Bureaux and the Imperial Institutes of Entomology and Mycology, which are thus servants of no one member of the British Commonwealth of Nations, but of all collectively.

The Bureaux have, as their chief function, the collection and dissemination of information of value to agricultural science on their respective subjects—entomology; mycology; soil science; animal health, nutrition and genetics; fruit production; plant genetics (herbage and non-herbage crops); and parasitology. In addition, the Imperial Institutes of Entomology and Mycology undertake the identification of specimens submitted.

The Seventh Annual Report of the Executive Council, just published, records a steady increase both in the services

* *The Problem of Nutrition: A World Survey by a Committee of the League of Nations.* Vol. IV. Statistics of Food Production, Consumption, and Prices. 1936. (Geneva: League of Nations Publications Department. London: Allen and Unwin. Price 3s.).

NOTES FOR THE MONTH

provided and in the use made of those services;* and the separate reports of the bureaux and institutes, which form appendixes to the Council's report, emphasize this growth, and illustrate the diversity of the requests received and the services rendered. Special mention may be made of the report of the Parasite Laboratory attached to the Institute of Entomology, which has had some notable successes in the control of insect pests and of weeds by utilizing parasitic insects inimical to them.

Conference on Mechanized Farming, 1937

THE Second Conference on Mechanized Farming will be held at Rhodes House, Oxford, on January 5-8, 1937, under the joint auspices of the School of Rural Economy, the Agricultural Economics Research Institute and the Institute for Research in Agricultural Engineering of the University of Oxford. Mr. C. S. Orwin (Director, Agricultural Economics Research Institute) will open the proceedings at 2.30 p.m. on January 5, his address being followed by a paper on "Tractor Performance in Theory and Practice" by Messrs. S. J. Wright and E. B. Black (Institute for Research in Agricultural Engineering). There will then be given three papers on "Practical Experiences with Row-Crop Equipment," Mr. Newcome Baker (Sedgeford) dealing with sugar-beet, Mr. F. W. Rockcliffe (West Walton) with potatoes, and Mr. D. R. Bomford (Pitchill, Evesham) with market garden crops in general. The Conference Dinner will be held in Christ Church Hall at 8 p.m. The meetings on the three following days will open at 9.30 a.m. On January 6, papers will be read by Dr. B. A. Keen (Rothamsted Experimental Station) on "The Scientific Basis of the Art of Cultivation," by Mr. C. Culpin (School of Agriculture, Cambridge) on "Some Modern Cultivation Problems," and by Mr. A. Amos (Spring Grove, Wye) on "A Practical Farmer's Views on Cultivation." At 4.30 p.m., there will be an open discussion on "Maintenance of Fertility," in which Sir Albert Howard, Dr. E. M. Crowther and Messrs. W. D. Hollis and D. R. Bomford will take part. The discussion will follow an introductory address by Mr. D. Skilbeck. On January 7,

* Imperial Agricultural Bureaux: Seventh Annual Report of the Executive Council, 1935-36. Obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, or through any bookseller, or from the Secretary, Imperial Agricultural Bureaux, 2, Queen Anne's Gate Buildings, London, S.W.1, price 5s. post free, 5s. 3d.

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Mr. E. J. Roberts (University College of North Wales) will review "A Year's Progress in Grass Drying," followed by three papers on "Practical Experiences with Grass Drying Equipment," Mr. A. G. Bazley (Hatherop) dealing with the Curtis-Hatherop drier, Mr. J. E. Chambers (Wanborough) with the Ransome drier, and Col. R. Vaughan-Williams (Uttoxeter) with the I.C.I. drier. Other papers that will be given are "The Production of Dried Grass and its Cost," by Messrs. R. N. Dixey and R. P. Askew (Agricultural Economics Research Institute), and "Some Speculations as to the Future of Grass Drying," by Professor J. A. Scott Watson. On January 8, Mr. J. E. Newman (Institute for Research in Agricultural Engineering) will give "A Review of Combine Harvesting in 1936," Mr. A. J. Hosier (Marlborough) will speak on "My First Year with the Combine," and the closing address will be delivered by Dr. H. J. Denham (Director, Institute for Research in Agricultural Engineering). The programme includes visits to engineering works and places of interest on the afternoons of January 6 and 7. Further particulars may be obtained from The Conference Secretary, 10, Parks Road, Oxford. The accommodation for the Conference being strictly limited, early application for tickets is advisable.

The World's Grain Crops

A REPORT on "Grain Crops,"* published by the Imperial Economic Committee, summarizes in the form of a statistical analysis the world production of and trade in certain grain crops during the period 1928 to 1935. The crops with which the report deals, namely wheat, barley, oats, maize and rice, are those of most importance to British countries. The work, while supplying a valuable statistical survey of the international trade in these commodities during the period reviewed, is limited somewhat in its analysis of world production by the absence of reliable information from certain countries.

It is shown that the world production for the five cereals in 1934 was lower than the average for the years 1928-1933. The British Empire accounted for roughly 23 per cent. of both acreage and production, although rice grown in the

* *Grain Crops: A Summary of figures of Production and Trade relating to Wheat, Wheat-flour, Barley, Oats, Maize and Rice.* Compiled by the Intelligence Branch of the Imperial Economic Committee. Obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2. Price 2s. 6d., post free, 2s. 8d.

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Empire alone amounted to 60 per cent. by acreage and 56 per cent. by weight of produce of the world's total production (excluding China). From the estimates of the International Institute of Agriculture, however, it is apparent that the Empire share of the total would have been considerably lower if it were possible to include the production of China. A feature of this period has been the increased production of wheat, barley and oats in the U.S.S.R., which during recent years has replaced the U.S.A. as the world's largest producer of these commodities. At the same time there has been a considerable diminution in the production of all these cereals in the U.S.A. Within the Empire, India is now the largest producer of both wheat and barley, in addition to maize and rice, although this position has been achieved, not so much by increased production in that country, as by a decline in Canadian production.

The most welcome result of the increased production of cereals in various countries has been the improvement in the world wheat situation. The encouragement given to wheat-growing in various European countries, aided by increased restrictions on imports, led to the accumulation of large stocks, reaching a peak in 1934 when the carry-over was estimated at over 31 million tons. Reduced acreage and drought have led to a gradual liquidation of stocks, the forecast of 16 $\frac{1}{2}$ million tons for 1936 being lower than in any year since 1928. As a result, 1935 saw an advance in prices to the highest level reached since 1930.

The report draws attention to the serious decline in the world trade in cereals since 1928, particularly to the decreased trade between North and South America and Europe, the exports from the U.S.A. having fallen from over 5 $\frac{1}{2}$ million tons in 1928 to a little over $\frac{1}{2}$ million in 1935, and Canadian exports from the abnormally high figure of 11 $\frac{1}{4}$ million tons in 1928 to 5 $\frac{1}{4}$ million in 1935. Against this, gross imports into Belgium, France, Netherlands, Germany, Switzerland, and Italy, have fallen from 17 $\frac{1}{2}$ million tons in 1928 to less than 9 million in 1935. The U.S.S.R. had in the period under review, only temporary importance as an exporter of its primary cereals, a sudden increase in the quantity of exports in 1930 and 1931 being followed by considerably reduced totals in succeeding years. A section of the report is devoted to the various forms of European import restriction which have contributed to this shrinkage in the European market.

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In dealing with the various crops individually, special attention is paid to the position of the Empire, and, in particular, to the United Kingdom, with regard to the world trade in these commodities. In spite of the fact that India is no longer an important wheat exporting country, the post-war increase in the production of Canada and Australia gives the Empire a net annual surplus of wheat and wheat flour. India normally has a surplus of rice sufficient to meet the requirements of other parts of the British Commonwealth, but for other cereals, particularly maize, the Empire must depend on foreign sources of supply.

Throughout the period, the United Kingdom has been by far the largest buyer of wheat and wheat flour, and in spite of the imposition of import duties in 1932 on wheat and wheat-flour from foreign countries, the volume of imports has not fluctuated to any marked extent during the eight-year period. In 1928 the imports of barley into Germany were far in excess of those into this country, but on account of the rapid decrease in German imports, the United Kingdom is now easily the most important of the principal importing countries. The volume of imports of this cereal into the United Kingdom has shown an irregular increase. On the other hand, the imports of oats had declined in 1934 to under one-half of the 1928 total, and Switzerland, with a tendency to increase its purchases, had become the chief importing country. The provisional 1935 total for maize imported into the United Kingdom was almost double that of the 1928 level, while the trade in rice in this country has been fairly constant since 1928.

In addition to the statistics of world production and trade in these cereals, an indication of ruling prices is given by tables showing the monthly average prices for specified grades of each cereal in this country during the period 1929 to 1935. These complete the survey of a period that began with a steadily falling price level and ended with a gradual recovery in the cereals market.

Voluntary Service

Voluntary Service is the title of the 16th Annual Report of the National Council of Social Service of 26, Bedford Square, London, W.C.1. The patron of the Council is His Majesty the King; the President is The Rt. Hon. the Viscount Bledisloe, P.C., G.C.M.G., K.B.E., the Chairman is the Warden of All Souls (Dr. W. G. S. Adams, C.H.); and the Vice-Chairman, Mr. R. C. Norman. The Chairman of the

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Unemployment Committee is Dr. A. D. Lindsay, C.B.E. (Vice-Chancellor of the University of Oxford). As a record of a year's work in many directions in which social service is urgently required, the Report is an important and, to those unacquainted with that field of labour, an arresting document.

A large part of the Council's energies has been devoted to the furtherance of voluntary work with unemployed people who stand in real need of opportunities for activity to break the monotony of idleness. The Report shows something of what is being done in that direction by voluntary effort, though admittedly the Council's work, and its inspiration of others to work, cannot cover more than a small part of so large a subject. To understand what is being done and what can be done even in this limited field, one has to see the interesting descriptive photographs in the document and to read the Report itself. To all those who desire to lend a hand in helping to ameliorate the hard lot of the unemployed, there can be no more helpful and inspiriting a document.

A subsidiary matter is the progress in rural industries development through the agency of the Rural Industries Bureau in London and the Rural Community Councils in certain counties. This shows definite and encouraging advance and the enterprise might usefully be extended to other counties of Great Britain. The Report can be obtained, price 1s. net, from the Council's offices.

Agricultural Machinery Testing Committee

CERTIFICATE AND REPORT No. 64 in respect of the test of the Barford Invicta Boiler and Sterilizing Chest have now been published in pamphlet form. The test, which was carried out at the National Institute for Research in Dairying, was in two parts. In the first part, the boiler only was tested, and the evaporation rates, heat balance, fuel consumption and steaming efficiency were determined when it was operated with a hand-force feed pump and with a steam-injector feed. In the second part, the complete installations were tested under working conditions, in which measurements were taken of operating times for efficient sterilization with the chest full of tinned-steel utensils and the chest full of glass bottles.

Full details of the test are given in the pamphlet, copies of which can be obtained from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 3d. (by post 3½d.) each.

THE APPLICATION OF SCIENCE TO THE POULTRY INDUSTRY*

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Poultry Commissioner, Ministry of Agriculture and Fisheries.

THE modern practice of poultry husbandry is an art. Now an art may be defined as the application of knowledge to effect a desired purpose, or the performance of certain actions requiring not only the possession of knowledge but the skill to apply it.

Science may broadly be defined as knowledge in general or as a collection of the general principles or leading truths on any subject. Such knowledge may be acquired through study, experience, observation, and by deliberate investigation, experiment and research. The degree of knowledge that human beings possess on any subject, seldom remains stationary for any length of time, but generally increases more or less rapidly—sometimes very rapidly indeed.

Now, much has been learnt in the course of time of science in relation to poultry husbandry, but, as the main objective of most poultry-keepers is to make as big a profit as possible from their efforts, commercial considerations have largely governed the extent to which science or knowledge, whether old or new, has been applied to the industry. It is known, for example, that, by certain operations, the sexual character of a fowl can be altered so that the female looks and behaves as a male, and *vice versa*: but this knowledge, so far at all events, is not capable of profitable commercial application in the industry. On the other hand, the knowledge that by caponising a cockerel its capacity for producing table meat is greatly increased, has led to the application of this knowledge to commercial practice in many countries. These examples illustrate, therefore, why it is that some of our existing knowledge—we may call it scientific knowledge if we like—is not applied in practice. Do not let us, however, despise that sort of knowledge, for we never know when it may become commercially useful. For example, Gregor Mendel, the Austrian monk, no doubt little thought, when he

* A paper read in connexion with the British Association meeting at Blackpool, 1936.

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wrote his famous treatise on the mode of inheritance of certain characters in peas, that his work would affect the methods of poultry-keepers generations afterwards. Nor did the discoverers of vitamins imagine, at all events at first, that their discoveries would later on help poultry-keepers to prevent "leg weakness" in their chickens.

The application of science to the poultry industry is not only governed by considerations of commercial expediency. It is also influenced by the immediate conditions of the industry and its future prospects. In the middle, and until nearly the end, of the last century, poultry-keeping was not so much an industry as a despised and tolerated adjunct to farming practice and was conducted chiefly on scavenging lines. The farmer, as a rule, was firmly convinced that poultry-keeping was not profitable except to the women of his household, and therefore, he took little or no interest in it and refused to spend money either in buying good food for the birds or in trying out new methods based on such knowledge as was then actually available. Similarly, there were then practically no scientific research workers or investigators seeking for further knowledge, partly because there was no money available either from private or State sources to pay for their services, and partly because there were few trained investigators or research workers in existence in this country.

Towards the beginning of this century, however, more attention was drawn to the possibilities of the industry. Profits from arable agriculture had become difficult to achieve. The dairying industry was expanding, and more and more arable land was being laid down to pasture, thus providing more suitable agricultural conditions for an expansion of poultry-keeping. The demand for eggs and poultry for the table was increasing, and the sums paid annually to other countries for these products were growing into many millions. Meantime, developments were taking place in America, where work in poultry education and research was expanding and new methods of the large-scale intensive and semi-intensive types were being tried. These American developments began to influence opinion and practice in this country, and simultaneously the effects of the extension of poultry education in England, made possible through funds available under the Technical Instruction Act of 1899, and the Local Taxation Act of 1890, began to appear. A few attempts to establish specialist poultry farms were made. Farmers

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commenced to keep poultry in portable houses out in their fields, and, influenced no doubt by the proximity of the good markets offered by the populations of adjacent large industrial areas, there was laid the foundation of the huge development of the industry that has since taken place in Lancashire.

All these developments were accompanied with many failures, and exposed many unexpected difficulties, which existing knowledge was insufficient to solve. No doubt some of the difficulties that caused failures and financial losses to poultry-keepers had been experienced by the older type of farm poultry-keeper many years before; but since the farmer at that time was not usually interested in his birds and anyhow expected no profit to himself from them, a few deaths more or less in the flock or in the young chickens, or a partial or even total absence of eggs did not greatly concern him. In any event the birds were mainly scavengers, while the fact that they had free range round the farmstead, were kept in limited numbers and under such rigorous conditions that they simply had to be healthy or die, meant that the death rate was actually much lower, on the average, than with birds kept in larger numbers and under more congested conditions, even though the latter might be better fed and managed.

A demand for more knowledge gradually arose and has continued to grow, but though poultry-keeping continued to expand slowly, this demand was not yet either sufficiently insistent or extensive to secure any appreciable expansion in the provision for education, investigation and research. A good deal of progress was made, however, in the adoption of better methods by the more intelligent poultry-keepers, who derived some assistance and stimulus from a study of developments in other countries, and at the same time experimented for themselves in a practical way. These experiments, however, often proved costly, and generally there was little confidence in the possibility of making a satisfactory profit from the production of eggs and poultry for the table—the principal and only foundation on which the poultry industry as a whole can rest.

Then came the Great War, with its scarcity and abnormally high prices. The active interest of the Nation was turned to the problems of food production, and with the end of the War began the boom in poultry-keeping. This boom attracted new types of poultry-keepers drawn from every class, every profession, every business and every occupation:

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the ex-soldier, the ex-sailor (able-bodied or partially disabled), the ex-engineer, ex-anything! Many of these newcomers were highly educated, highly intelligent; and many of them were competent in business acumen and experience, and full of energy, initiative and ideas. Unfortunately, most of them were without any experience of the industry they were entering, and many possessed little or quite insufficient capital. The newcomers of the better type were accompanied by large numbers who were quite unfitted—temperamentally, financially and physically, as well as in experience and knowledge—for the adventure on which they were starting. So, in spite of the favourable conditions offered by the industry—conditions that continued more or less for nearly a decade—there were many failures.

In spite of these difficulties, however, the industry in this country experienced the most rapid period of expansion in its history—an expansion that was accompanied by a rapid increase in knowledge of the fundamental principles of poultry husbandry and in the efforts made to apply this knowledge to commercial practice. This expansion was no doubt due largely to the favourable economic conditions that then existed for poultry-keepers. The War had heavily depleted poultry stocks in nearly every country, and this depletion was particularly felt in Britain, which for many years before the War had been accustomed to depend for nearly 70 per cent. of its annual consumption of eggs on supplies from overseas. Further, public taste was moving towards lighter foods, such as eggs, fruit, etc., and away from the heavier foodstuffs. Then, too, the prices obtainable for home produced eggs compared very favourably with those obtainable for other farm products, and also with the cost of the feeding stuffs required by the birds.

The greater demand for, and appreciation of knowledge, shown by both the new and the older types of poultry-keeper, and the efforts made to apply this knowledge, not only by the poultry-keeper but by the poultry appliance maker and the poultry-feeding-stuff merchant, played an important part in the advance. This change in the mental attitude of the poultry-keeper towards science was supported by the State, and, through the Ministry of Agriculture, the Development Commission and, more latterly, the Agricultural Research Council, greatly increased funds were made available for education, investigation and research in connexion with the

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many problems and difficulties, both old and new, which this rapid expansion threw up vividly to the surface. County and Agricultural Institute staffs for poultry educational work were greatly increased. New Research Institutes were established, or the staffs of existing Institutes expanded, and immeasurably greater facilities were created for investigating the problems of disease, nutrition, economics, breeding and marketing, than existed in pre-War times.

How, then, has this increase in knowledge of the scientific truths relating to the numerous activities of poultry husbandry affected its practice? How has the science of poultry husbandry influenced the art?

The finding of an answer to these questions involves consideration of the sciences relating to the poultry-keeper's work, and if we examine the syllabus of the National Poultry Diploma Board, which sets out the subjects that must be studied by candidates for the National Diploma in Poultry Husbandry, we can see how numerous these sciences are—biology, chemistry (organic and inorganic), and physics; anatomy, physiology and pathology. It should be remembered, too, that though our knowledge of the way in which these sciences can affect the art of poultry husbandry has been greatly extended in recent years, there is a vast field still to be explored and charted. We have not yet learnt how to avoid or control some of the poultry diseases and the heavy rate of mortality which still imposes so serious a handicap on the industry. We have still much to learn regarding the nutrition of the fowl and its relation to disease and mortality and unthriftiness; and, in the field of breeding and the methods of inheritance of desirable economic qualities, our knowledge is still very limited.

Poultry Diseases. Let us, first of all, examine the subject of poultry diseases—their prevention and control. Some idea of the importance of this subject to the industry may be gathered from the fact that the State has recently set up a Special Committee to inquire into the causes of the high mortality in poultry. The National Veterinary Medical Association has estimated that the monetary loss caused annually through mortality amongst poultry in this country amounts to £4,000,000 per annum. In America, this loss is put at £11,000,000 per annum. What this sum might have amounted to in this country if our scientific knowledge had

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not become greater than it was, say, 20 years ago, can be imagined even if it cannot be definitely calculated.

Bacillary White Diarrhoea.—Take, as an example, the extent of the financial loss incurred some years ago through the ravages caused by bacillary white diarrhoea before the application of the agglutination test, which was devised in 1913. To-day, with the aid of millions of these tests applied annually, this disease is not regarded as a serious menace by poultry-keepers who test their flocks regularly. Further, many thousands of poultry-keepers who annually require to purchase large numbers of day-old chicks and eggs for hatching, as well as adult stock birds, depend upon this test to guard them from the dangers arising from the introduction of the disease to their premises. Many breeders of pure-bred stock and the large commercial hatcheries would find it difficult, if not impossible, to do business if they were unable to offer their customers the safeguard provided through the discovery and application of this test; and not only can it be used to discover "carrier" birds of bacillary white diarrhoea, but also those infected with fowl typhoid, and "carrier" ducks infected by other *Salmonella* micro-organisms, *S. aertrycke* and *S. gærtneri*.

Fowl Pox.—One of the best known and most troublesome diseases used to be fowl pox, often erroneously called roup. Few poultry yards were free from occasional outbreaks, and though the rate of mortality might not be high, the disease, through its persistence over long periods and its injurious effects upon the birds, caused considerable loss, trouble and expense, particularly as individual and daily treatment of the birds was often attempted. Nowadays the discovery of a vaccine that produces immunity in unaffected birds for a period of from four to six months enables the poultry-keeper, with its aid, to check the spread of this disease and, by killing off the affected birds, to eradicate the disease from his farm.

Fowl Typhoid is an acute infectious disease, world-wide in its distribution. Sometimes the development of this disease is very rapid and mortality may be as high as 80 per cent. As already stated, carrier birds of this disease may be detected by the agglutination test, and it is important that this test should be applied, for these carrier birds, as in the case of B.W.D., harbour and transmit the causal agent of the disease, but may themselves give no outward signs of being infected. A vaccine is also now available for the inoculation of uninfected birds in the flock.

Coccidiosis.—It is often stated—probably with much justification—that coccidiosis causes annually more loss to the industry than any other single disease. It is true, unfortunately, that our knowledge regarding this disease, its prevention and eradication, is yet far from complete. We do know, however, that there are at least six different kinds of coccidia that may cause this disease, and that though a chicken that has recovered from an attack from one of these kinds may become resistant to a subsequent attack from the same kind, it is not immune from attacks from the other five. We know, too, that the disease cannot develop to a very dangerous stage without repeated re-infestation, which takes place from continued contact between the birds and the infected droppings. If, therefore, the chickens are kept as little as possible in contact with droppings, the progress of the disease can be checked and possibly eliminated. For this reason chicks are now often reared on wire floors, which permit infected droppings to pass through and be removed. This system is, of course, more difficult to adopt with older birds, though the use of laying batteries, which seems to be extending, may partially overcome this difficulty.

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The above examples show some of the outstanding instances where science has definitely been applied to the industry in connexion with disease prevention and control, but there are many other ways in which the increase in our knowledge of the causal agents of disease and their life history and habits have enabled poultry-keepers more effectively to apply practical counter measures.

Blackhead in turkeys and *Gapes* in chickens may be largely, if not entirely, avoided by rearing the birds under intensive conditions on wire floors. In blackhead the principal source of infection is from land contaminated by the droppings of affected birds. A bird apparently in good health may act as a carrier and thus give rise to an outbreak of disease. As regards the gape-worm, which only rarely affects chickens after they are over 4 weeks of age, the bird picks up from the ground either the free larva or an earthworm or snail containing the larvae, and so becomes infected. Eggs from the gape-worms actually in the windpipe of the bird find their way into its mouth and finally pass out in the droppings, to develop in turn into fresh larvae.

Our knowledge of other worm diseases affecting poultry has also expanded, though definite practical methods of prevention and control have yet to be discovered. We do know, however, that parasitic worms do not multiply within the body of the fowl and that of the large numbers of eggs—sometimes millions—which each parasitic worm is able to produce, not one comes to maturity within the bird, but only does so after being voided with the bird's droppings and then spending varying periods outside. This knowledge has led—as with other diseases—to the adoption of methods for disinfecting both plant and land; and whilst much has been learnt from science which has enabled these methods to be made more efficient, especially as regards disinfection of poultry houses and appliances, the attempts to disinfect the soil are only partially successful.

Apart from these concrete examples of the application of science to methods for the prevention and control of disease, it should be remembered that through the spread of education large numbers of poultry-keepers to-day are able to recognize the initial symptoms of many common poultry diseases and know what initial measures to take, or are ready to call in expert advice in the early stages of an outbreak.

Nutrition. If we turn to the field of nutrition we also find that much progress has been made. If we look back a few years before the War and think of the rations then given to poultry and compare them with those in use to-day, we can realize how great an advance has been made. A continuous diet of wheat, maize, oats or barley, was often given, and the grain was frequently of poor quality. On many farms a wet mash of barley meal, supplemented at night with grain screenings from the threshing mill, or similar poor stuff, was the

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regular diet of the birds. Chickens were often reared on nothing but small wheat, oatmeal or cracked maize. It was fortunate that most of the birds so fed were kept on more or less free range or round a farmsteading and were thus able to supplement their rations from other sources. Even so, the average egg yield obtained was usually very low, and eggs in winter-time were mostly conspicuous by their absence.

The intensive and semi-intensive poultry plants on the scale on which they exist to-day could certainly not continue to function for long if they had to use the feeding methods practised in those old times. Practically nothing was known of the fowl's capacity to digest the various kinds of feeding stuffs available. Nothing was known of the daily requirements of the bird for maintenance, growth, and production, at various levels; and little was known of the daily needs in protein or starch equivalent. Vitamins were undiscovered and mineral supplements scarcely thought of, though a few of the old exhibition breeders often gave bone meal to their young chickens, as well as a chemical mixture of phosphates (from a bottle).

Nowadays, heavy laying strains of poultry have been developed; high average yields are expected from commercial laying flocks; chickens are expected to make rapid growth and the birds must be able to fatten well; chicks are reared intensively on large-scale lines in houses that allow only restricted amounts of sunshine; hens are kept under similar conditions in laying batteries. How long could these developments and new methods be sustained if our knowledge of the nutrition of the fowl were only what it was twenty—or even ten—years ago? Most of us can remember how difficult it used to be to rear winter chickens, which had to be given protection from the weather, and how often these birds went down on their legs, or refused to thrive or even live. We also remember how often the early attempts at intensive poultry-keeping failed mainly because the essential factors of vitamin supply, adequate sunshine and fresh air were not understood. The whole history of the development of the battery system of rearing chickens is full of examples of the all-important influence of nutritional factors. How many of those who now rear thousands of chickens annually on this system would have the courage or the foolishness to continue to use these methods, if it were not for the knowledge of the nutritive and hygienic requirements of battery-reared chicks.

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made available by the numerous investigators and scientific workers during recent years.

It is only necessary to examine the ingredients of up-to-date poultry mashes—chick mash, grower's mash, layer's mash, breeder's mash, etc.—to see how the results of the scientific knowledge on nutrition acquired by the experimenter and the research worker have been incorporated into the daily practice of the poultry-keeper. These mashes contain proteins, carbohydrates and fats of the right kind and quantity, and the necessary vitamins and minerals. The ingredients must be fresh and in proper mechanical condition, sufficiently digestible and of adequate bulk; while they are incorporated and blended in varying quantities and proportions, according to the age and future purpose of the birds and the system of management under which they are kept. In fact, our knowledge of the nutritive requirements of the fowl in its various stages of life and activity has advanced so far, that it is possible to estimate, with fair accuracy, the daily requirements of the laying hen, according to the body-weight and rate of egg production. It is not possible here to deal in any detail with this subject, but those who may desire fuller information are recommended to study the Ministry's Bulletin No. 7 (*The Scientific Principles of Poultry Feeding*),* written by Mr. E. T. Halnan, M.A., of the School of Agriculture, Cambridge.

Genetics, Anatomy and Physiology. Let us turn now for a few moments to the field covered by genetics, anatomy and physiology, and see how far these sciences have been applied in practice. Within this field, the work of scientists such as Bateson, Punnett, Pease, Goodale, Pearl, Crew, Greenwood, Dunn, etc., has been of much influence and value. The name of Professor Punnett in particular will always be remembered in the poultry world, especially for his work on sex-linked inheritance. During his investigations at Cambridge, it was found that the hen, when mated according to definite principles, transmits certain characters to her male but not to her female progeny. Most of the characters that have been so far investigated in domestic poultry are transmitted on Mendelian lines; that is to say, either parent transmits them

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2. Temporarily out of print. The 4th (revised and enlarged) Edition is now in the press.

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equally to either sex of the offspring. A few characters, however, are transmitted by the hen solely to her male offspring. Four of these characters have become of commercial importance, for they enable the sex of chickens from certain first crosses—and more latterly from one pure breed—to be distinguished when hatched. These four characters are (1) Silver ground colour of plumage and down as opposed to Gold; (2) Barred plumage (such as is found in Plymouth Rocks) as opposed to Unbarred plumage; (3) certain forms of light-shank colour as opposed to dark-shank colour, and (4) slow feathering as opposed to rapid feathering.

This scientific knowledge has become of great commercial importance, since it not only enables the large commercial hatcheries—which, taken together, distribute millions of cross-bred day-old chicks annually to their customers—to supply pullets or cockerels only as desired; but it enables the smaller poultry keeper, if he wishes to do so, to dispose of his male chicks at birth and to utilize the whole of his rearing capacity for his pullet chicks. With the development, in recent years, of large commercial egg-producing plants that require only pullets and hens for their purposes, this breeding method is also of much benefit. It should be stated that so far only one pure breed showing automatic sex-linkage within the breed, namely the Cambar, has been developed; but a pure breed of duck and another pure breed of fowl are in course of development at Cambridge, and there seems to be no reason why other breeds of fowls showing automatic sex-linkage should not be developed.

Another important application of science to practice has made commercial "sexing" of chickens and ducklings possible. This practice appears to have been in use in China for centuries past, and was demonstrated in this country by Crew at Edinburgh some years ago. It was, however, in Japan that the art of chick sexing was developed into a commercial practice, and skilled Japanese operators carried this practice into many other countries. Its successful operation depends upon the capacity quickly to recognize the difference between the sexes as regards the appearance of the sexual organ situated in the vent, and upon delicacy of touch in handling the chicken. This method enables the sex of any breed of chicken to be detected with a high degree of accuracy when hatched—about 95 per cent. with skilled operators. It is not so accurate a method as that available through sex-linkage, and sometimes damage is done to the birds in handling them. Sexing operators, however, are now employed by many of the large hatcheries both here and in other countries, and the practice has become commercially important.

Poultry Appliances. If we next consider poultry appliances and their accessories now in use, we can again observe how science has assisted practice. Perhaps an outstanding example of this fact is the modern incubator. It is true that artificial incubation was an ancient practice in both China and Egypt, but the primitive egg ovens of Egypt would scarcely be suitable for the needs of British poultry husbandry to-day, as they are much inferior, as regards facilities for

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control and ease and economy of working, to our modern mammoth incubators.

It is interesting, however, to note that, according to records made by the Statistical Service of the Egyptian Ministry of Agriculture, there were in 1915-16 over 33 million eggs hatched in some 570 Egyptian egg ovens, the percentage of chickens hatched to eggs laid down varying from 57 to 73 per cent. The capacity of these ovens varies from 24,000 to 90,000 eggs each. They are built of bricks made from sun-dried Nile mud, and are usually rectangular in shape, containing two compartments—an upper and a lower—and have dome-shaped roofs. The heat is supplied by burning chopped bean straw mixed with dried cakes of horse or cattle dung. Thermometers are not used, but the temperature is judged by the operator putting an egg against his eyelid. The temperature, according to recorded particulars, varies daily from the first to the eleventh day from 95° F. to 104° F., and afterwards remains practically constant around 94° F. After the eleventh day, no heat except that provided by the developing embryos in the egg is supplied. The eggs are moved in rotation three times a day for the first seven days, and afterwards twice daily. They are tested after the seventh day by holding each egg in front of an olive oil lamp, or against the sun's rays coming through an aperture in the roof. As the method of working these ovens is regarded as a traditional secret in certain families, a high degree of skill is usual amongst the operators.

It is claimed by some writers that the art of hatching eggs artificially was introduced into Europe by two scientific members of Napoleon Bonaparte's expedition to Egypt. At any rate, it is known that Réaumur, a French scientist who experimented about the middle of the eighteenth century with artificial incubation—and incidentally invented the thermometer—was one of the pioneers of the modern incubator. He investigated the part played by humidity in artificial hatching, and it is interesting to note that nearly 200 years later his conclusions were generally corroborated by Romanoff, a research worker in America. The investigations of other workers in connexion with the composition of air, air movement and atmospheric pressure in the hatching chamber, and investigations into the physics of incubation, such as those of Chattock at Bristol, have all played their part in the development of the modern machine that occupies so important a place in poultry husbandry to-day. The thermometer and the thermostatic capsule combine to make this machine infinitely superior to the ancient egg oven of former times. The modern incubator, too, illustrates the most outstanding example of the application of the science of electricity to poultry husbandry, for, with a mammoth machine, electricity is often used not only as the source of heat, but also as a source of power for driving the fan that forces warm and fresh air over the eggs, and—in the case of certain machines—even for automatically moving the eggs at regular intervals. Poultry-keepers who enjoy the facilities provided by the modern incubator for hatching eggs probably seldom give a thought to the laborious work, done by numbers of scientists in former years, which has made possible the development of the modern machine.

The application of electricity to poultry husbandry may be observed in numerous other instances. Electric heat is now used for hovers and battery brooders, and through the skill of the electrical engineer, various types of heating units are available—luminous heat, dark heat, and an open-heater providing radiant heat. Electric power is applied to egg-grading machines, plucking machines, food mixers, and sometimes to corn mills. Many poultry farms use electric lighting both for outside

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and inside purposes, especially for putting the birds under "lights" in the winter months. It is also used for egg-testing machines. In fact, the application of the science of electricity to poultry husbandry affects intimately the daily life of so many poultry-keepers that any idea of going back to non-electric methods would be to them unthinkable.

Storage. We may now briefly examine the part played by science in the storage of eggs and poultry. Methods of preserving eggs have been adopted for generations past, the older methods depending mainly upon the slowing down of the rate of evaporation of the moisture content of the egg. The lime-water and water-glass-solution methods not only check this rate of evaporation but also inhibit the development of putrefying bacteria and moulds, and probably slow down the rate of oxidation of the egg contents, which, during storage, tend to become thin and watery.

A combination of knowledge of chemistry and engineering and its practical application has produced the refrigerator or cold-store, which nowadays is much used both in this country and overseas, and on board ship, for the preservation of eggs, and to a smaller extent for the preservation of table poultry. Mr. H. W. Pasteur, in a paper read before the British Association of Refrigeration, states that: "the most common method of refrigeration is the compression system, the most commonly used mediums being ammonia, carbon dioxide, methyl chloride, and sulphur dioxide. The process consists of:

- (1) Evaporation of the liquid of constant pressure and temperature at a low level, the heat of evaporation being drawn from the surrounding medium, such as air, brine or water.
- (2) Compression of the evaporated gas to a high pressure and temperature.
- (3) Removal of superheat, latent heat, and sensible heat at constant pressure causing the liquefaction of the medium.
- (4) The passage of the liquid through a throttle valve from the high pressure to the low pressure side.

Shell eggs can be stored for several months at 32° F. but it is very important to maintain an even temperature and a humidity of about 85 per cent. If the air is too dry, the eggs lose weight and shrink; and, if it is too damp, mould frequently forms on them.

Small chilling rooms are now found on a few large poultry farms where table-poultry production is carried out on a fairly extensive scale. The chilling room is used to cool the birds before they are packed and sent to market, thus avoiding complaints, especially prevalent during hot weather, that when the birds reach the markets they have become green and unfit for sale.

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A new method of storing eggs has now been developed in which the eggs, after having the air in them extracted in a vacuum and being kept for a short period in a mixture of CO₂ and nitrogen, are stored in a steel chamber with a similar gaseous mixture.

A large store of this type has now been in operation for some years in this country and there are about a dozen altogether in Europe. It is claimed that this method gives excellent results, since the gaseous mixture in which the eggs are stored inhibits in the white and yolk chemical changes that often produce a thinning or watery appearance of the egg contents in stored eggs, and that it also prevents the appearance of moulds and bacteria whatever the percentage of humidity. It is also claimed that after long storage, the air-space of the egg is very small; that no sweating occurs in the eggs when they are removed from the egg stores; and that they then actually keep in good condition longer than eggs laid on the day the gas-stored eggs were taken out.

General. So far we have dealt with definite examples of the application of science to the poultry industry. The use of science may be a two-edged weapon, especially if applied in a partial or careless manner. As already observed, our present knowledge of the various sciences relating to poultry husbandry is far from complete, and there may be some reason for asking ourselves whether, in applying our partial knowledge to practice, we have not in some directions produced some undesirable results and conditions.

For example, it is sometimes said that the modern incubator has reached such a high state of efficiency that weak embryos are developed and hatched into chickens which later on become unthrifty and unprofitable. It is, however, difficult to say whether the production of these weakly chickens is due to the efficiency of the incubator or to some weakness or unsatisfactory condition in the breeding stock that produced the eggs. It may have been that the application of our knowledge—incomplete as it is—of the mode of inheritance of a particular economic quality, such as egg yield, has been unwisely applied in the production of the breeding stock and has thus produced—perhaps cumulatively through several generations—some physical or physiological weakness in the birds themselves. It may be that our increase in knowledge of the nutritive requirements of the fowl, and of the nature of the feeding stuffs needed to give rapid growth and early maturity, have been applied without sufficient knowledge of the ultimate effect on the constitution of the birds and of their progeny. Although these and similar undesirable results may perhaps have been brought about by the application of incomplete knowledge, it illustrates not only the possible dangers of such procedure, but also the urgent necessity for a further increase in our knowledge.

The concrete examples already given regarding the applications of science relate to only a small part of the poultry research and investigation that has been done and is still going on in many parts of the world. If we may now give a little play to our imagination, it may be interesting to

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consider some of the possible effects on the future practice of poultry husbandry which the present investigations of the research worker may perhaps achieve. As previously stated, the increase in the rate of mortality amongst poultry constitutes one of the most important and urgent problems requiring solution. This problem is very complex in character. Birds may die from specific diseases, or from physical breakdown of various kinds. To what extent are deaths from these causes preventable? To what extent are they brought about by errors in breeding, feeding and management? There may be errors the adverse effects of which on the birds may not have been strongly visible for one or more bird generations, but may have been cumulative, until in some succeeding generation the damage done expresses itself in an outbreak of disease or an alarmingly high rate of mortality from what seem to be obscure causes.

Much investigation has been done, and much is still going on, into the influence on the nutrition of the bird of the so-called accessory food substances, vitamins and minerals; and already, much of the knowledge gained is reflected in the composition of poultry rations in common use to-day; but our knowledge of vitamins and their influence is still incomplete, and the part played by the various mineral substances in the metabolism of the hen is by no means fully known. As regards poultry rations it has been found that a deficiency of the known vitamins and of certain mineral substances, or an excess of the latter, will cause definite forms of disease or physical breakdown, but it may be that, before long, our knowledge of the relationship between nutrition and certain diseases will so improve that it will be possible to exercise a much greater measure of prevention of or control over outbreaks of these diseases than is possible at present.

Much has been done to improve existing methods and to determine new means of producing in fowls immunization against certain diseases. Already certain vaccines mentioned above are in common use. The disease known as fowl paralysis, which has caused heavy ravages in this country, is at present undergoing investigation in several countries. So far, even the means and conditions of its transmission are not known, but it may be that before long this disease, too, may yield its secrets to the patience and perseverance of the research worker. It is not only through an improvement in our knowledge of therapeutics, the application of vaccines,

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etc., that our control over disease may be improved; it may be that the geneticists may in time be able to assist the poultry-keeper in producing strains of birds with a high degree of natural resistance against certain diseases. In this field, some very suggestive investigations are being conducted at Edinburgh by Dr. Greenwood, who is also examining the possibilities of breeding birds that will produce eggs at an economic level over a period of from three to four years, and also non-moulting birds that will produce continuously over a two-year period. The possibilities of new scientific discoveries of this kind are attractive.

In the meantime, the poultry-keeper should feel grateful for the help that science has already given him. He should do what he can to support and encourage research workers who spend their lives in activities that must of necessity often prove disappointing in their results. Above all, the poultry-keeper should be ready for the reception of new ideas, although in practice economic reasons may compel him to be somewhat conservative in putting them into operation. It is fortunate for him, however, that there are now so many State-aided institutions at which new ideas and new discoveries can be tested on a commercial scale, and so save both the time and money of the individual poultry-keeper in making these tests for himself.

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EIGHTEENTH-CENTURY CROP HUSBANDRY IN SOMERSET AND WILTSHIRE

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Somerset was always devoted to grazing, although the rich soil of the Vale of Taunton made it flourish with cereals and orchards. It was, indeed, said by the numerous contemporary topographers to be "good for the abider but bad for the rider," and Young, when he came to visit the district, emphatically agreed that the roads were bad. Defoe tells us that the whole district between Bridgwater and Bristol was a rich grazing country, and mentions the Cheddar cheese.¹

Almost the earliest definite fact we learn about the county is that Red Clover or Marl grass was much grown, the wild seed having been collected and propagated by Farmer James of Chilcompton near Wells, by whom it was reputed to last from fifteen to twenty years, but only on a soil where blue marl is.² At Watchet on the coast there was a lime-burning industry both for manure and for cement in 1768. Both the clover and the lime burning show that Somerset farmers were up-to-date in the eighteenth-century.³

Young visited the county in 1771, and all the country from Chard to Taunton and Bridgwater was then thickly inclosed. At Henlade, the course of cropping was clover, wheat, barley and clover, wheat, wheat, barley, etc. A compost was used of headland soil and dung, and dung and lime. Corn was dear, but none of the pasture was being broken up. Mixed teams of horses and oxen were used. There were many orchards in the district. At Halfwell there were similar long courses, but Sedgmoor was a waste of 11,500 acres, the Quantocks were dreary hills, and Hunsfield Moors were also waste. At Compton a rotation of fallow, wheat, barley, oats was used. This was a bad system and was practised where the farms were under no restraint of cropping, such as might have been placed upon an open field-farm. The land was held in "several" and there was no excuse for this rotation. Young was horrified by its worthlessness and does not hesitate to condemn it. Twelve corn crops were, indeed, sometimes taken in succession. There was an improvable common at Stone Easton.⁴

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Near Bridgwater things were much better; the Norfolk course had been adopted by 1795, lime was freely applied, and oxen were used for ploughing, but the drainage of Sedgmoor had not led to any greater improvement than inclosure in 1797, although the rich district was estimated by Young as thirty miles long by ten miles wide.⁵ Many of the farms were in the hands of occupier-owners, and were not large, seldom exceeding an annual value of £200 a year, although at West Camel there were large farms running up to £1,000 rent, and on these there was an improved system.⁶ In this district, flax and hemp were grown in great abundance, and turnips on a large scale, fallowing being given up at the end of the century.

On the Mendips, a good deal of lime was used, but the tillage was said to be very defective, there being few turnips, while fallowing was general. Little barley was grown, but teasles for the wool manufacturers made a paying crop. Potatoes had become general, although uncommon thirty or forty years before. The whole district was full of orchards, paring and burning had been given up, and marl was used in some parishes.

In the south-east of the county, turnips were general and the upland was used for tillage, the lowland for grazing. Drilling had only been tried by two farmers, and the courses and manuring had not been changed.⁷ Perhaps this was not so foolish as it may seem, because Maton, who may, of course, be relating a traveller's tale, tells us that 35 bushels of wheat per acre had been harvested on the moors for eighteen years in succession.⁸ The ploughs of the county were strong, some having one wheel and some a foot only; the mouldboard was, however, usually too long; the harrow was quite ordinary; there were no threshing machines; but the waggons were small, compact and well-made.⁹

Wiltshire. The large extent of Salisbury Plain, in the heart of the county, provided sheep walk and a measure of alternate husbandry, but the general farming of the county to the north and south of the Plain did not change very much during the century.¹⁰ Such improvements as had been made were slight, and some of them must be allocated to a period before 1700. Land was limed here in Lisle's day (*c.* 1700). One farmer of the county tried to persuade him to keep an

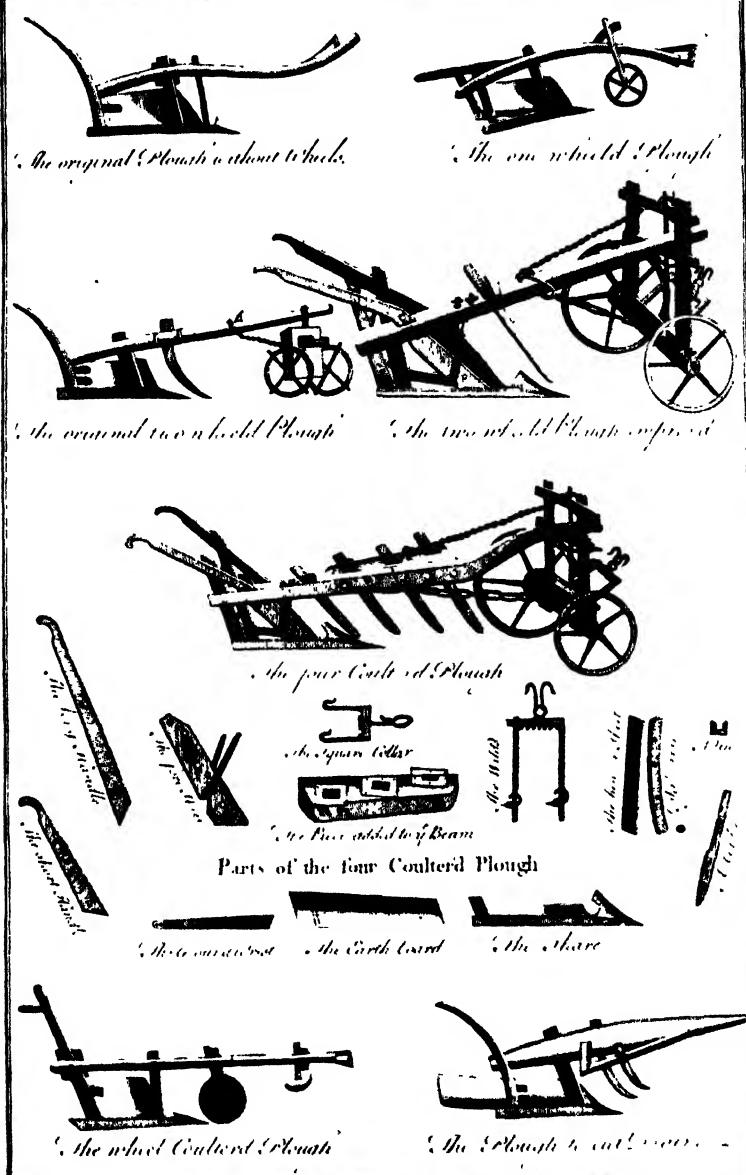
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ox-team with his horse-plough, because they would be able to summer fallow the strongest lands in dry weather if harnessed ten to a plough. Another farmer, living at Puck Shipton, had broken up grass land and sown oats, great wheat and red wheat, so that the land was tamed. Broad clover was sown with black or white oats in preference to barley, provided the ground worked up mellow. At Holt they did not roll, but sowed their wheat in round furrows 4 in. deep, and after reaping they stooked their wheat in such manner that it might be left out a month. At Colne they ploughed-in broad clover the second year, rolled it or trod it in with sheep, and sowed wheat.¹¹

Early in the century a great deal of the downland had been ploughed for wheat by means of the sheep-fold as a preparation, but the lower parts, as in the adjoining parts of Gloucester, were occupied in large dairy and grazing farms.¹² The improved or rath-ripe barley sowed in Oxford and neighbouring counties was an achievement in eighteenth-century plant-breeding, which had its origin in this county, but fresh seed had to be obtained from the local producers as it did not retain its early ripening character when continuously sown in the other counties.¹³ Hale could, however, pass the remark in 1756 that the noted starving parts of Wiltshire and Hampshire could be made like Buckingham and Hertford by inclosure.¹⁴ Sainfoin was an established crop in the county and was said to have been introduced about 1660.¹⁵

Young found the farms between Devizes and Salisbury very large—from 600 to 800 acres of arable and down in addition. Three or four horses were used in a plough and were barely able to achieve the standard acre a day. The course was the old three-field system of wheat, barley, fallow, but he says there were many turnips. Hogs, he says, were fed on whey, grains, etc., for the famous bacon, but Mordant says they were, like the sheep on turnips, staked out in the clover. Some paring and burning was done, and Young regrets the pasture on the Plain, which would make fine tillage.¹⁶ All the open field in the north of the county was still under a system of two or three white crops and fallow, but most of this part was devoted to dairies and sheep.

Between Marlborough and Hungerford there were watered meadows, and here some of the land was under improved courses in 1771.¹⁷ Between Savernake and Hungerford, indeed, the Rev. Richard Warner says that land soon



Engraved for The Compleat Body of Husbandry. Printed by the King's Clutter'd; in Westmorland.

This engraving shows generally the types of plough used in the middle of the eighteenth century. It has been chosen to illustrate this essay, because the writer is not acquainted with any contemporary drawing which shows the ploughs used in the counties discussed.

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degenerates (from picturesque wilderness) into open corn-field, but near the town it recovered a little spirit. He was, perhaps, the earliest writer to think cornland a degeneration.¹⁸ Both issues of the report were written by Thomas Davis, and, with few exceptions, the crops and rotations were the same when he wrote as they were in the early part of the century.

In the south-east of the county, some of the open-field farmers had agreed to sow clover and rye grass in place of the fallow, and some had even gone so far as to lay out four fields for the purpose. Oats were not much cultivated here, and few beans or peas, barley being the favourite crop. There were few turnips, but a good deal of rape was grown on the downs, while rye was grown for sheep feed and potatoes had become popular.

In the inclosures, some farmers had adopted the Norfolk course; some, however, fallowed two years for wheat on the downs. The sheep-fold was the general manure, little farm-yard dung being used. Peat was used at Pewsey, the red lands were chalked, and some marl was used on the strong lands. Paring and burning was still used, and in the "Cotswolds" part, the rotation was wheat, oats, turnips, barley, clover mown, clover fed and a summer fallow.¹⁹

In addition to the large farms mentioned by Young, the Reporter tells us that there were many small farms held on customary tenure, and the rentals of these ranged between £18 and £40 a year, a few rising as high as £50; some consolidation was taking place at the end of the century and some Scottish farmers had come to the county in 1813, being given twenty-one year leases, because they had the reputation of being better farmers than the natives.²⁰

Two kinds of ploughs were used. On the hills a two-wheel, and a one-wheel which could also be used as a foot-plough if the wheel were taken off. The old harrows were still in use in 1813. Waggonns were only used for hay and corn, but both carts and waggonns were heavy and clumsy. A nine-share plough (really a cultivator) and a drag harrow were used for preparing the seed-bed on light down land.²¹

¹ *Tour, 1724*, II, Letter I, pp. 27, 38.

² Richard North: *An Account of the Different Kind of Grasses*, 1759, p. 4.

³ *Rural Elegance Display'd*, 1768, p. 277.

⁴ *Eastern Tour, 1771*, III, pp. 392-419: IV, pp. 4-22.

⁵ *Annals, XXIII* (1795), pp. 417, 418; *XXIX* (1797), pp. 304-5, 315-6.

⁶ A. Billingsley: *Somerset, 1798*, pp. 31, 34, 269; *Annals, XXVIII*, p. 48.

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- ¹ Billingsley: *ibid.*, pp. 90, 107-110, 115, 124, 131, 132, 213, 218, 220, 269, 273, 274, 279, 282; Marshall, *West of England*, 1796, II, pp. 168-171.
- ² Wm. George Maton: *op. cit.*, p. 116.
- ³ Billingsley: *op. cit.*, pp. 46-47.
- ⁴ Ernle: *English Farming Past and Present*, p. 233-4.
- ⁵ Observations . . . 1757, I, pp. 73, 136, 167 ff., 210, 227, 332; II, p. 49.
- ⁶ Defoe: *Tour*, 1724, II, Letter I, p. 45 ff., 49; *ibid.*, 1753, I, p. 249; II, pp. 39, 40, 44-5.
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- ⁷ Laurence: *ibid.*, p. 96.
- ⁸ *Compleat Body*, 1756, p. 100.
- ⁹ *Museum Rusticum*, I (1768), p. 463.
- ¹⁰ *Six Weeks' Tour*, 1768, pp. 153-167.
- Mordant: *Complete Steward*, 1761, p. 151.
- ¹¹ Young: *Eastern Tour*, 1771, IV, pp. 26-33; *Annals*, VII (1787), pp. 55-81.
- ¹² *Observations on the River Wye . . . in . . . 1770, 1782*, p. 96.
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- Marshall: *Southern Counties*, II, pp. 319-331.
- Report*, 1813, pp. 55-71, 105-6, 110-111, 114.
- ¹⁵ Report, 1794, p. 14; *ibid.*, 1813, pp. 15, 171-2.
- ¹⁶ Report, 1813, pp. 35-37, 52-53.

LIVE STOCK IMPROVEMENT SCHEME: REPORT FOR THE YEAR ENDED MARCH 31, 1936

THERE has been little change during the year under review in the operation of the Live Stock Improvement Scheme. The location of premium bulls has continued to be somewhat adversely affected by the increased attention now being paid to milk production as compared with stock-rearing. The demand for premium boars has, however, been maintained, as the need for good boars for the production of the right type of bacon for present market requirements is widely recognized. The trade for heavy horses has continued good, with the result that still further increases have been shown in the numbers of stallions travelled by Societies with the aid of grants from the Ministry.

There has now been sufficient time for the provisions of the Improvement of Live Stock (Licensing of Bulls) Act, 1931, which came into force in England and Wales on August 1, 1934, to become well known to farmers, and from the number of applications for licences that are received by the Ministry it is clear that there is very little attempt at evasion of the Act.

There is little doubt that the great majority of stock-breeders in England and Wales are now satisfied that the licensing of bulls is in every respect a useful measure, and that in the course of time it will result in a marked improvement in the general standard of cattle in the country.

Premium Bulls. The fixed price for milk and the unsatisfactory price of beef have resulted in a continuance of the increased attention to dairying, to which reference was made in the report on the Scheme for the year 1934-35. This tendency has caused farmers to attach more importance to breeding for milk production, and less consideration has been given to the type of animals bred. Indiscriminate crossing by the use of bulls of purely dairy breeds, without regard to the breed of the cows, has continued, and this is likely to have a serious effect in the near future. Owing to the use of these bulls the standard of stores for feeding has already deteriorated to some extent, and there is a shortage of good type stores. In the circumstances, it is satisfactory to be able to record that there are still some farmers who refuse to introduce dairy sires into herds with a beef tradition. The

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trade in store cattle has shown some improvement, and the higher prices farmers have had to pay for dairy cows of milking quality to replenish their herds should increase the interest in the rearing of good-class cattle.

Other factors adversely affecting the distribution of premium bulls under the Scheme are:—

(1) More farmers are keeping their own bulls owing to the increase in the size of their herds and the difficulty of driving cows for service, due to present day road traffic.

(2) A tendency on the part of some farmers to think that any bull that may have been licensed is good enough to bring about an immediate improvement in their stock, regardless of the fact that the standard for licensing purposes cannot approach that required for a premium bull. In one village, where there was a bull Society, nine bulls sired by the premium bull, but belonging to different owners, were licensed. The Society then lapsed through lack of support.

(3) Initial outlay involved in the purchase of a premium bull.

Despite these difficulties, there is evidence of good work performed by premium bulls in improving the quality of the cattle. In many instances where premium bulls have been used for some time, the herds of the custodians of the bulls are object lessons of what can be achieved by the use of good-class sires. A custodian of a Midland Bull Society, whose herd has been built up by means of premium bulls, won the second prize in a Milk Recording Society's Large Herd Competition for the second successive year.

The number of premium bulls at the end of March, 1936, was 1,469, a decrease of 7 on the previous year.

TABLE I.—NUMBER OF BULLS SUBSIDIZED EACH YEAR SINCE THE COMMENCEMENT OF THE SCHEME

<i>Year (April 1–March 31)</i>	<i>No. of Bulls</i>	<i>Year (April 1–March 31)</i>	<i>No. of Bulls</i>
1914–15	..	1925–26	..
1915–16	497	1926–27	1,175
1916–17	633	1927–28	1,287
1917–18	659	1928–29	1,372
1918–19	710	1929–30	1,408
1919–20	721	1930–31	1,476
1920–21	675	1931–32	1,537
1921–22	668	1932–33	1,494
1922–23	847	1933–34	1,452
1923–24	947	1934–35	1,469
1924–25	978	1935–36	1,476
	1,069		1,469

The total number of cows served during the year was 96,827, belonging to 22,634 owners, compared with 94,728 cows belonging to 22,781 owners in the previous year. The average number of services per bull was 67. The average

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numbers of persons sending cows to each bull was 16; 14 in England and 19 in Wales. The average number of cows sent by each owner was a little over four.

The standard of premium bulls has been fairly well maintained, and in some districts there is a keen demand for bulls that have completed their period under the Scheme. In one district in Wales efforts are being made through the local branches of the National Farmers' Union to supply farmers with lists of such bulls, and in this district the demand far exceeds the supply.

During the year under review the Shropshire Live Stock Improvement Association was formed to stimulate the improvement of live stock in the county by impressing upon farmers the importance of using the sires subsidized under the Ministry's Scheme. It held its first show of the progeny of premium sires in Shropshire at Shrewsbury in May, 1936, and there were over 100 individual exhibitors and over 300 entries. A scheme for the marking of the progeny of premium bulls is in operation.

The Bletchley and District Live Stock Improvement Society's Scheme for the earmarking of calves got by premium bulls continues to make progress, the number of animals marked during the year showing an increase of 180 over the previous year's number. Steady progress has also been made in the schemes in Staffordshire, but the Warwickshire scheme has lapsed.

The Welsh Dragon Mark Association was formed in 1931 as the Brecon, Radnor and Monmouth Welsh Dragon Mark Cattle Association, and comprised the members of premium bull societies in those counties. The progeny of premium bulls were tattooed with the Association's mark, and steps were taken to establish direct contact between the members and purchasers of store cattle in the Midlands. The success of the scheme led to its being taken over by the Welsh Agricultural Organization Society, under whose ægis the scheme continues to flourish. The success of the spring and autumn sales in the Brecon, Radnor and Monmouth districts has been distinctly encouraging. Efforts have been made to extend the scheme to other parts of Wales, but the exceptionally low prices obtained for store cattle have militated against its extension. The Welsh Black Cattle Society approved the scheme in principle, but considered the time inopportune to undertake a similar organization for their breed.

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Premium bulls and their progeny continue to do well at shows and sales. One premium Hereford bull was sold for export to the Argentine for 150 guineas, whilst another and his son sold for 120 guineas and 48 guineas respectively. Twelve bulls sired by a premium bull in 1934 and 1935 averaged 45 guineas each at Penrith. The progeny of a premium bull located in Wales won the first prize and challenge cup at the Southern, Midland and Welsh Shorthorn Breeders Association's Show and Sale at Birmingham for the second year in succession, whilst an eleven-month-old dairy bull, sired by a premium bull, won a second prize at the Show and sold for 70 guineas.

A premium Shorthorn bull was first in its class and reserve male champion at the Royal Show, and a South Devon bull, which had been located under the Scheme for three years, won the championship of its breed. A Devon bull won two firsts and a second at the Devon County Show, a third at the Bath and West, and three firsts and a championship at the Royal Cornwall Show. The champion Shorthorn bull at the Royal Welsh Show was a premium bull.

Breeds and Prices. Table II gives the number and average prices of each breed located in the last three years. It will be seen that the average price of subsidized bulls is slightly less than last year.

TABLE II.—NUMBER AND AVERAGE PRICES OF PREMIUM BULLS.

BREED	1933-34			1934-35			1935-36		
	No.	Average price	No.	Average price	No.	Average price			
Aberdeen Angus ..	6	£ 39 12 0	7	36 9 10	5	39 5 5			
British Friesian ..	3	50 1 8	5	49 3 2	6	49 6 0			
Devon	194	47 6 7	200	46 17 4	202	46 7 3			
Galloway	3	27 6 0	3	27 6 0	3	27 6 0			
Guernsey	28	37 8 5	31	39 4 7	29	39 2 10			
Hereford	214	40 4 5	213	39 7 3	218	39 15 5			
Lincoln Red Short-horn	152	39 1 2	157	39 1 5	157	39 4 7			
Red Poll	2	38 7 0	1	36 15 0	1	31 10 0			
Shorthorn	773	41 18 0	759	41 4 9	750	40 12 2			
South Devon	13	43 15 0	15	42 15 3	14	40 4 5			
Sussex	8	34 14 3	9	34 8 5	7	31 14 5			
Welsh Black	73	27 18 6	76	27 19 4	77	27 2 11			
All Breeds	1,469	41 5 1	1,476	40 14 5	1,469	40 6 11			

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There is little change in the relative numbers of the different breeds to be recorded in 1935-36. Shorthorns account for more than half of the premium bulls, but are 9 fewer than last year. The number of dairy Shorthorns increased from 504 in 1934-35 to 536, but beef and dual-purpose Shorthorns decreased from 171 and 84, to 141 and 73 respectively. In considering the number of bulls of different breeds in respect of which grants are made, it should be remembered that the choice of breed of bull is a matter left to the Society, but normally the Ministry requires to be satisfied that most of the cows that will be brought to the bull for service are of the same breed or type as the bull. The reason for this is that it is only by grading up within the breed that progressive improvement can be secured by the successive use of good bulls.

Service Fees. The service fees charged for the use of premium bulls during the past three years have been as follows:—

SERVICE FEES—BULLS.

Year	2/6	3/-	3/6	3/9	4/-	4/6	5/-	5/6	6/-	
1933-34	..	79	52	56	1	147	14	865	9	109
1934-35	..	95	48	61	1	173	20	833	9	108
1935-36	..	93	57	60	1	179	21	831	8	99
Year	6/6	7/-	7/6	8/-	8/6	9/-	9/6	10/-	10/6	
1933-34	..	14	3	106	5	—	—	9	—	
1934-35	..	11	5	103	4	—	—	5	—	
1935-36	..	11	4	100	2	—	—	2	1	

Service fees continue to show a lower tendency, although 5s. remains the popular charge. The number of fees above 5s. have declined from 245 in 1934-35 to 227, whilst those under 5s. have increased from 398 to 411.

Premium Boars. It is evident that the Pig Marketing Scheme is having a good effect on pig-breeding in general. Reports from the Ministry's Live Stock Officers show that greater care is being taken in selecting breeding stock with the object of providing the correct type of pig to meet the requirements of the bacon factory, and it is now more generally realized that the choice of the boar is an important factor. More attention is also being paid to scientific feeding, and, where careful breeding and feeding have been practised, prices have not been unremunerative.

The Ministry continues to receive reports of improvement in the quality of pigs in districts where premium boars have

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been located for some years. Satisfactory prices have generally been realized for the progeny of premium boars, and they have usually graded well when run to bacon weights. It is reported that in one district a large dealer buys nearly all the pigs sired by premium boars and pays about 2s 6d. a head above the average market price for them. All these pigs are sold by him to feeders.

There is a tendency for farmers to increase the number of sows they keep, and to retain a boar of their own rather than make use of the premium boar. At the same time it is reported in some districts that cottagers and labourers who have been in the habit of keeping one or two sows have been discouraged by the low prices obtained for young pigs and have given up breeding. This also has affected the use of premium boars, with the result that the number of boars located under the Scheme on March 31, 1936, was 1,029, a reduction of three on the previous year.

TABLE III.—NUMBER OF BOARS SUBSIDIZED EACH YEAR SINCE THE COMMENCEMENT OF THE SCHEME.

Year (April 1—March 31)	No. of Boars	Year (April 1—March 31)	No. of Boars
1914–15	115	1925–26	710
1915–16	193	1926–27	844
1916–17	216	1927–28	907
1917–18	264	1928–29	933
1918–19	350	1929–30	972
1919–20	399	1930–31	1,047
1920–21	441	1931–32	1,024
1921–22	550	1932–33	973
1922–23	569	1933–34	1,007
1923–24	638	1934–35	1,032
1924–25	655	1935–36	1,029

The average number of services per boar in service years expiring in 1935–36 was 65. The total number of sows served was 65,699, belonging to 25,178 persons.

Breeds and Prices. Table IV gives the number and average prices of each breed in the last three years. This shows that the average price for the Large White, which comprises the vast majority of the subsidized boars, decreased by 1s. to £10 18s.

Large Whites showed no diminution in popularity from the high position reached in the previous year. Welsh Boars increased from 24 to 33, principally at the expense of the Long White Lop-eared; the number of Welsh Boars located in Wales was 32 against 23 in the previous year, whilst during the same period the number of Long White Lop-eared

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TABLE IV.—NUMBER AND AVERAGE PRICES OF BOARS OF EACH BREED.

BREED	1933-34			1934-35			1935-36		
	No.	Average price	No.	Average price	No.	Average price	No.	Average price	No.
Berkshire	6	£ 9 1 6	2	13 13 0	1	15 15 0			
Cumberland	11	9 4 5	2	8 14 0	2	7 7 3			
Essex	2	9 9 0	1	10 10 0	1	8 0 0			
Gloucester Old Spots	1	10 10 0	—	—	—	—			
Large Black	8	12 1 3	5	11 9 2	3	10 6 8			
Large White	915	10 8 11	969	10 19 0	970	10 18 0			
Lincoln Curly Coated	5	6 10 10	—	—	—	—			
Long White Lop-eared	16	11 18 6	16	11 13 11	10	10 13 7			
Middle White	21	9 9 1	11	9 4 6	8	10 7 8			
Wessex Saddle-back	2	8 18 6	2	11 11 0	1	13 13 0			
Welsh	20	11 16 8	24	11 13 5	33	11 8 10			
All Breeds	1,007	10 8 10	1,032	10 19 3	1,029	10 18 2			

decreased in Wales from 12 to 7. There were 185 Large Whites in Wales in 1935-36, as against 188 in the previous year.

Service Fees. The following table shows the service fees charged during the last three years:—

SERVICE FEES—BOARS						
Year	2/6	3/-	3/6	4/-	4/6	5/-
1933-34	4	11	18	92	6	743
1934-35	2	11	21	99	7	763
1935-36	4	13	23	97	6	772
Year	6/-	6/6	7/-	7/6	8/-	10/-
1933-34	70	3	2	53	—	3
1934-35	71	2	1	50	1	2
1935-36	61	1	2	46	1	1

There is little change to record, but the gradual tendency towards lower service fees continues. The service fee for about 75 per cent. of the boars is 5s., while for 14 per cent. the charge is less than 5s., and only in the remaining 11 per cent. is more than 5s. charged.

Premium Rams. Thirty grants for Welsh Mountain Rams were available for the 1935 season, all of which were utilized. Originated as an experimental measure in North Wales in order to encourage the breeding of an approved type of Welsh Mountain Sheep, it has now been extended throughout

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Wales; in fact, two-thirds of the premium rams are now located in the uplands of South Wales. The hiring fees ranged from £6 to £12, with service fees from 1s. to 3s. per ewe. Twenty-five of the rams were hired at £10 or over. During the season, 1,804 ewes were sent for service under the scheme, an average of 60 ewes per ram. Progress under this section of the Live Stock Improvement Scheme is very marked, owing to the fact that the ewes as well as the rams must conform to type and are subject to approval by the Live Stock Officer.

Horse Breeding : Heavy-Horse Grants. Improvement in prices of young horses and geldings during the year has provided a marked stimulus to horse-breeding, and farmers who supported the Heavy-Horse Societies during the years of depression are now reaping the benefit. The improvement in the trade is reflected in the 12 per cent. increase in the number of stallions licensed under the Horse Breeding Act, 1918 (see a later section of the Report), and in the increased number of stallions subsidized under the Ministry's Live Stock Improvement Scheme. In some districts, stallions hired by societies are in opposition to privately-owned stallions travelling at lower fees, and the support accorded to the societies in the face of such competition is evidence that the provision of good-class sires is appreciated by the members. In this connexion it is interesting to note that:

- (1) The champion stallion at the Shire Horse Show, 1936, was hired by a Hereford society;
- (2) two Clydesdale stallions hired by northern societies changed hands for 1,600 and 1,200 guineas respectively in the spring; and
- (3) the Suffolk stallion that was the champion at the Ipswich Show and reserve champion at the Royal Show was hired by a society in Suffolk.

Each of these societies operated under the Ministry's Scheme.

The progeny of premium stallions have made good prices at the sales. A colt and a filly sired by a Yorkshire society's horse sold for 100 guineas each, geldings sired by premium stallions sold at Carlisle for £80 and £90, whilst at the Autumn Foal Show and Sale at Crewe, 10 foals by a premium stallion sold at an average price of 47 guineas, a colt foal selling for 105 guineas and a filly foal for 60 guineas.

The show record of the progeny of one premium stallion that has travelled for six years under the Ministry's Scheme

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is deserving of note. At the 1936 Shire Horse Show its progeny obtained the following prizes:—

First and supreme champion stallion; first and junior champion stallion; 3rd and 6th prizes yearling colt class and 6th prize in yearling filly class.

In addition, its progeny also won numerous prizes at the Warwick County and other shows. Another premium stallion sired last year's female champion and this year's first prize two-year-old filly at the London Show.

TABLE V.—HEAVY-HORSE SCHEME

<i>Service Season</i>	<i>No. of Stallions</i>	<i>Total No. of Mares served</i>	<i>Average No. of Mares served</i>	<i>No. of Assisted Nominations</i>	<i>Average Hiring Fee of Stallions £</i>	<i>Average Service Fee £ s. d.</i>
1914 ..	72	6,365	68	1,503	231	2 8 6
1915 ..	97	9,122	94	2,430	241	2 9 6
1916 ..	108	9,995	92	2,181	244	2 11 0
1917 ..	110	10,556	96	2,151	258	2 16 3
1918 ..	122	12,281	100	2,165	285	2 15 8
1919 ..	118	10,920	96	1,996	317	3 6 3
1920 ..	105	9,133	87	1,839	345	3 13 1
1921 ..	101	7,888	78	1,943	333	3 13 7
1924 ..	87	6,098	70	*	178	2 7 0
1925 ..	96	7,413	77	1,723	194	2 8 4
1926 ..	98	8,165	83	2,171	208	2 8 6
1927 ..	105	8,950	85	2,599	211	2 8 9
1928 ..	114	9,792	86	2,805	217	2 9 4
1929 ..	120	10,196	85	3,052	221	2 9 9
1930 ..	140	12,248	87	3,604	239	2 11 1
1931 ..	159	14,226	89	4,266	235	2 10 2
1932 ..	162	14,624	90	3,945	226	2 9 9
1933 ..	165	15,655	95	4,280	220	2 10 8
1934 ..	170	16,071	95	4,353	221	2 10 6
1935 ..	185	17,548	95	4,710	231	2 10 8

The figures in Table V do not include those relating to the Cumberland and Westmorland Heavy Horse Breeding Society, which issues assisted nominations to selected stallions travelled by their owners in Cumberland and Westmorland. The figures for this Society are:—

<i>Service Season</i>	<i>No. of Assisted Nominations</i>	<i>Service Season</i>	<i>No. of Assisted Nominations</i>
1915 ..	385	1927 ..	247
1916 ..	394	1928 ..	281
1917 ..	328	1929 ..	283
1918 ..	321	1930 ..	269
1919 ..	264	1931 ..	290
1920 ..	254	1932 ..	198
1921 ..	255	1933 ..	217
1924 ..	121	1934 ..	209
1925 ..	197	1935 ..	208
1926 ..	220		

* No grant was made by the Ministry for assisted nominations (except to the Cumberland and Westmorland Society) for the service season 1924.

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The average hiring fee of the stallions subsidized was £10 higher than in the previous year, and grants were paid in respect of 15 more stallions.

The number of assisted nominations issued was 4,918, an increase of 356 over that in 1934-35, and as the regulations permit of the award of only one assisted nomination to a mare owner, it will be seen that the smaller farmer is sharing in the prosperity of this branch of agriculture. The average service fee shows no appreciable change, whilst the average number of mares served per stallion was the same as in the previous year. The total number of mares served, including those of the Cumberland and Westmorland Society, amounted to 17,756, which is the highest number reached under the Scheme since its inception, and shows an increase of nearly 1,500 compared with 1935. There were 144 Shire, 22 Clydesdale and 19 Suffolk stallions travelled under the Scheme in 1935, as compared with 132 Shire, 22 Clydesdale and 16 Suffolk stallions in 1934.

The number of foals produced by stallions subsidized in 1934 was 9,259, which indicates that 58·5 per cent. of the services were fertile. This compares with 8,769 foals and 58·3 per cent. in the previous year. The average foaling percentages of stallions of the three breeds used under the Scheme was Shire 58·6, Clydesdale 52·4, and Suffolk 68·1.

Licensing of Stallions. The steady increase which has been noticeable in the last few years in the number of stallions licensed under the Horse Breeding Act, 1918,

TABLE VI.—LICENSING OF STALLIONS

Year (ending October 31)	No. of Applications for Licences	No. of Licences issued	No. of Refusals
1920	..	4,153	3,749
1921	..	4,060	3,816
1922	..	3,644	3,479
1923	..	2,897	2,761
1924	..	2,285	2,210
1925	..	1,908	1,849
1926	..	1,664	1,608
1927	..	1,574	1,537
1928	..	1,454	1,414
1929	..	1,472	1,436
1930	..	1,472	1,430
1931	..	1,470	1,432
1932	..	1,522	1,477
1933	..	1,556	1,516
1934	..	1,732	1,687
1935	..	1,945	1,893

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continued in 1935; the total number of licences issued in England and Wales was 1,893, an increase of 206, or 12 per cent., on the previous year; as compared with 1931 the increase amounts to as much as 32 per cent. Licences were refused in respect of 52 stallions, an increase of 7 as compared with 1934. Of the rejected stallions, 48 were of heavy breeds and 4 of light breeds.

Numerically the greatest increase in heavy stallions was shown by Shires, in respect of which 1,074 licences were

TABLE VII.—NUMBERS OF LICENCES GRANTED UNDER THE HORSE BREEDING ACT, 1918, IN ENGLAND AND WALES, 1934 AND 1935

BREED OR TYPE	Pedigree (i.e., Stallions entered or accepted for entry in the recognized Stud Book of their Breed)		Non-Pedigree (i.e., Stallions not entered or accepted for entry in a recognized Stud Book)		Totals of each Breed and Type (Pedigree and Non-Pedigree)	
	1934	1935	1934	1935	1934	1935
HEAVY						
Shire ..	837	922	125	152	962	1,074
Clydesdale ..	138	153	25	31	163	184
Suffolk ..	176	202	6	8	182	210
Percheron ..	67	76	4	4	71	80
Others ..	—	—	55	68	55	68
Total Heavy Horses	1,218	1,353	215	263	1,433	1,616
LIGHT						
Hackney ..	11	11	5	6	16	17
Thoroughbred ..	140	161	3	2	143	163
Arab ..	9	8	3	2	12	10
Others ..	7	5	3	8	10	13
Total Light Horses	167	185	14	18	181	203
PONIES AND COBS						
Welsh ..	8	8	1	1	9	9
Fell ..	9	7	1	2	10	9
Dales ..	9	10	6	5	15	15
Polo and Riding ..	10	8	1	2	11	10
Welsh Cob ..	17	17	8	11	25	28
Others ..	3	3	—	—	3	3
Total Ponies and Cobs ..	50	53	17	21	73	74
TOTALS ..	1,441	1,591	246	302	1,687	1,893

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issued; this is 112 more than in 1934, or an increase of nearly 12 per cent. Relatively larger increases, however, were shown by other heavy horses, Suffolks rising from 182 in 1934 to 210 in 1935 (15 per cent.), Clydesdales from 163 to 184 (13 per cent.) and Percherons from 71 to 80 (13 per cent.). The number of light stallions licensed was 203, and the increase of 22 over the 1934 figure is mainly attributable to the greater number of thoroughbreds licensed.

The number of stallions rejected for each of the prescribed diseases and defects was as follows:—

Whistling	..	..	..	5	Bone Spavin	..	..	4
Roaring	..	..	..	12	Stringhalt	..	..	2
Sidebone	..	..	..	15	Defective Genital Organs	..	..	1
Cataract	..	..	..	6	Poor Conformation and			
Ringbone	..	..	..	5	Physique	..	..	2

Fourteen appeals were lodged against the Ministry's decision to refuse to grant licences, as compared with 7 in the previous year, and 9 of them were successful.

The number of infringements of the Act reported to the Ministry during the season was 47, an increase of 21 on the number reported in the preceding season. Most of the infringements reported were in respect of the travelling or exhibition for service of licensed stallions unaccompanied by their licences, and the owners and leaders were warned by the Ministry or police as to the requirements of the Act in this respect. In three instances, however, proceedings were taken by the police in respect of the travelling of unlicensed stallions, and convictions were obtained in two cases.

Importation of Canadian Cattle. The Ottawa Agreements Act, 1932, made it possible for Canadian cattle capable of being used for breeding to be imported into this country for purposes other than slaughter, subject to the proviso that the Minister might require any such cattle to be slaughtered within the landing place if, in his opinion, they could be used for breeding and were not suitable for that purpose. The arrangements to give effect to these provisions were embodied in the Importation of Cattle Order, 1933, which came into force on January 17, 1933.

The first cargo of cattle landed under the Order arrived at Birkenhead on January 24, 1933, and examinations of cattle that are capable of being used for breeding have been carried out at the ports of landing continuously since that date.

During the year under review, the good demand for cattle

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in the United States led to the movement of cattle from Canada to the States and there was a striking reduction in the number of Canadian cattle imported into Great Britain. During the year only 11 cargoes arrived, compared with 93 in the preceding twelve months, and the total number of cattle landed was 2,304, as against 47,850 in the previous year.

Cattle that were capable of being used for breeding numbered 616, and of these 246 were rejected as not being of sufficient merit to permit of their entry into Great Britain for breeding purposes, and were slaughtered. The cattle rejected consisted of 22 bulls, 20 cows and 204 heifers. It should, however, be borne in mind that a large proportion of the cattle sent from Canada, capable of being used for breeding, are not sent for this purpose, but are consigned for immediate slaughter.

The number of steers landed was 1,688 as compared with 38,526 in the previous year.

Licensing of Bulls. Particulars of the numbers of applications for bull licences dealt with during the twelve months ending March 31, 1936, are shown in Table VIII, with comparative figures for the twelve months ending July 31, 1935, which represented the first year of the operation of the Improvement of Live Stock (Licensing of Bulls) Act, 1931.

TABLE VIII.—LICENSING OF BULLS

	<i>Twelve Months ended July 31, 1935</i>	<i>Twelve Months ended March 31, 1936</i>
Applications for Licences received	28,269	38,426
Licences issued	22,607	31,969
Rejections notified	2,378	4,690
Permits issued	21	53
Licences suspended	41 (a)	32 (a)
Licences transferred	10,045	21,408
Licences expired	281	928
Appeals to referees received	95	285
Appeals to referees dealt with	89 (b)	269 (c)

(a) Licences suspended pending recovery of the bulls from temporary forms of disease (mainly ringworm).

(b) Of these 50 were decided in favour of the appellant, while in 39 cases the Ministry's decision was confirmed.

(c) Of these 138 were decided in favour of the appellant, while in 131 cases the Ministry's decision was confirmed.

It will be observed that the number of applications shows a considerable increase, and the position will soon be reached, as the older bulls die out, when practically all bulls in the country being used for service will be licensed animals. The

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leaflets that set out the requirements of the Act, and that have been circulated to all farmers with their Agricultural Returns schedule, have helped to achieve this result, but there is at the same time no doubt that the prosecutions for keeping unlicensed bulls that the Ministry has felt compelled to bring in different parts of the country have stimulated applications. There is not at present any serious tendency on the part of farmers to evade the provisions of the Act, but where evasion does occur, it is generally found among milk producers, who are content to use any bull, however poor it may be, provided it is able to achieve the purpose of bringing the cows into milk.

The Act requires applications to be submitted early enough to enable a bull to be licensed by the time it reaches the age of ten months. The applications received show that some farmers keep their bulls till they reach the age of 12 to 18 months before they apply for licences, and there is reason to believe that, in some instances, the bull has been used to serve cows before an application is submitted. Instances occur where an attempt is made to cover up the irregularity by understating the age of the bull on the application form. The Ministry is giving close attention to the possibility of evasion of the Act in this way, and farmers should realize that they are rendering themselves liable to penalties if they keep a bull without a licence after it has reached the age of ten months.

More bulls have been rejected as unsuitable for licensing during the twelve months ending March 31, 1936, the number so rejected comprising 12.8 per cent. of the total number examined, as compared with 9.5 per cent. during the twelve months ending July 31, 1935. This larger percentage is due to the somewhat higher standard required for licensing as compared with that in force when the Act first came into operation, and must not be taken as an indication that a poorer type of bull has been coming forward for inspection. On the contrary, it is clear that the operation of the Act has caused many farmers to castrate, voluntarily, young bulls that they do not think are good enough to be passed for licensing, and there is no doubt that much more care is now being taken in the selection of calves for rearing as bulls. It has been noticeable that, where a bull has been rejected as unsuitable, an animal of a much better standard has been brought forward by the owner for licensing in the following year.

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Figures showing the number licensed and rejected in each county in England and Wales are given in Table IX. It was stated last year that these figures must not be used to draw deductions as to the parts of the country in which the best class of stock is to be found, and this still holds true owing to the variations in the standard of rejection which, at present, have to be adopted on account of the different standards of the stock to be found in the various districts.

TABLE IX.—PARTICULARS OF BULLS LICENSED AND REJECTED IN EACH COUNTY IN ENGLAND AND WALES FOR THE TWELVE MONTHS ENDED MARCH 31, 1936.

County	Licensed	Rejected	County	Licensed	Rejected			
ENGLAND—								
Bedfordshire	130	16	Suffolk	483	167			
Berkshire	421	29	Surrey	395	23			
Buckinghamshire	363	52	Sussex	790	50			
Cambridgeshire	207	21	Warwickshire	434	58			
Cheshire	1,215	312	Westmorland	894	77			
Cornwall	857	39	Wiltshire	1,016	72			
Cumberland	2,385	212	Worcestershire	241	48			
Derbyshire	921	170	Yorkshire	3,593	454			
Devonshire	880	69	TOTAL—ENGLAND..		4,015			
Dorset	707	52	WALES AND MONMOUTH—					
Durham	746	54	Anglesey	88	16			
Essex	513	96	Brecon	221	27			
Gloucestershire	610	76	Caernarvon	186	22			
Hampshire	830	45	Cardigan	332	62			
Herefordshire	675	52	Carmarthen	1,081	186			
Hertfordshire	250	19	Denbigh	457	95			
Huntingdonshire	67	9	Flint	322	51			
Isle of Wight	163	7	Glamorgan	219	47			
Kent	386	20	Merioneth	109	15			
Lancashire	1,401	442	Monmouth	222	39			
Leicestershire	494	52	Montgomery	247	59			
Lincolnshire	883	66	Pembroke	245	34			
Middlesex	27	2	Radnor	74	22			
Norfolk	470	169	TOTAL—WALES AND MONMOUTH ..		3,863	675		
Northamptonshire	330	23	TOTAL—ENGLAND AND WALES ..					
Northumberland	547	72						
Nottinghamshire	264	70						
Oxfordshire	367	21						
Rutland	41	1						
Shropshire	769	262						
Somerset	1,448	213						
Staffordshire	1,067	323						

The number of permits issued remains at a low level, as the Ministry has continued its policy of requiring castration to be carried out where possible. Practically all the permits issued have been in respect of "rig" bulls which the owners desired to keep for a period for fattening purposes.

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A very considerable increase has been shown in the number of licences transferred on change of ownership, but this is only in accordance with the normal course of events.

TABLE X.—PARTICULARS BY BREEDS OF BULLS LICENSED AND REJECTED

	Twelve months ended July 31, 1935		Twelve months ended March 31, 1936	
	Licensed	Rejected	Licensed	Rejected
Aberdeen Angus ..	635	38	851	57
Ayrshire ..	192	18	296	30
Blue Albion ..	37	6	44	6
British Friesian ..	1,210	95	2,010	187
Devon ..	720	38	1,037	77
Dexter ..	9	—	24	—
Dun and Belted Galloway ..	13	1	3	1
Galloway ..	258	27	272	26
Gloucestershire ..	3	—	6	1
Guernsey ..	969	35	1,515	60
Hereford ..	1,806	158	1,878	284
Highland ..	2	—	4	—
Jersey ..	328	14	478	27
Kerry ..	13	—	21	—
Lincoln Red Shorthorn ..	1,109	89	1,438	139
Longhorn ..	2	1	3	—
Park ..	18	—	16	1
Red Poll ..	417	44	575	108
Shorthorn ..	13,908	1,419	20,231	2,621
South Devon ..	270	6	424	21
Sussex ..	161	7	179	11
Welsh Black ..	296	18	386	22
Cross-bred ..	231	364	278	1,011
TOTAL ..	22,607	2,378	31,969	4,690

Table X shows the numbers licensed and rejected for each breed, with comparative figures for the earlier period of twelve months. These figures indicate that the increased percentage of rejections, to which reference has already been made, applied in the case of practically all breeds. For cross-bred bulls particularly, a higher standard was adopted, and this is reflected in the much greater percentage of rejected bulls of this type.

Milk Recording. Table XI shows the number of members of Milk Recording Societies in each year since 1917-18, when all Societies were required to adopt a uniform year, together with the number of herds and cows recorded.

There was a further increase in the membership of Milk

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TABLE XI.—NUMBER OF MILK RECORDING SOCIETIES

<i>Year ended October</i>	<i>Societies</i>	<i>Members</i>	<i>Herds</i>	<i>Cows</i>
1917-18 ..	27	639	708	19,793
1918-19 ..	38	1,191	1,332	37,880
1919-20 ..	46	2,075	2,312	61,323
1920-21 ..	52	3,328	3,664	97,903
1921-22 ..	55	3,949	4,362	117,023
1922-23 ..	55	4,365	4,767	127,151
1923-24 ..	52	4,764	5,209	138,086
1924-25 ..	50	5,081	5,516	148,905
1925-26 ..	49	5,174	5,656	154,322
1926-27 ..	51	5,166	5,650	156,847
1927-28 ..	50	4,862	5,320	149,971
1928-29 ..	50	4,616	5,065	144,812
1929-30 ..	49	4,501	4,934	140,266
1930-31 ..	49	4,412	4,836	137,866
1931-32 ..	49	4,267	4,682	135,912
1932-33 ..	49	4,187	4,598	135,902
1933-34 ..	49	4,211	4,622	141,325
1934-35 ..	49	4,264	4,696	148,426

Recording Societies and in the number of herds recorded in 1934-35, and, with the return of better conditions to agriculture, it seems possible that Milk Recording Societies may recover some of the ground lost in recent years.

Average Yield of Recorded Cows. The satisfactory supply of grass in the summer of 1935, following a fairly mild winter, coupled with the good hay available from the 1934 crop, had a beneficial effect on milk yields in 1934-35, and it is not, therefore, surprising that there was a considerable increase in the average yield of full-year cows. The average of 734 gal. is easily the highest obtained since the inception of the Scheme, being 30 gal. in excess of the average yield in 1933-34, and 15 gal. more than the previous record of 719 gal. which was obtained in 1930-31.

The number and average yield of milk of all cows recorded, and of full-year cows, for each year since 1917-18, are shown in Table XII.

Increased average yields were secured by 43 of the 49 Societies, the exceptions being in the far north of England and in Wales. The highest average yield was obtained by the Derby and District Society with 8,670 lb. (839 gal.), followed closely by Essex with 8,507 lb. (823 gal.), while Glamorgan, Lancashire, Norfolk, Peak, Suffolk and Yorkshire also exceeded 8,000 lb. (774 gal.). Eighteen societies had average yields between 7,500 lb. (726 gal.) and 8,000 lb. (774 gal.), and twelve societies secured yields between 7,000 lb. (677 gal.) and 7,500 lb. (726 gal.).

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TABLE XII.—AVERAGE YIELD OF RECORDED COWS

Year Oct. 1 to Oct. 1	Particulars of all cows and heifers recorded			Particulars of cows recorded for full year			
	No. of cows and heifers	Total yield	Aver- age yield*	No. of cows	Per- cent- age of total cows and heifers	Total yield	Aver- age yield*
1917-18	19,793	8,426,958	426	8,775	44	5,255,923	599
1918-19	37,880	16,204,941	450	17,989	47	10,543,516	579
1919-20	61,323	29,344,887	479	27,266	44	17,363,347	637
1920-21	97,903	48,512,380	495	48,248	49	30,892,620	640
1921-22	117,023	60,463,617	517	63,318	54	41,208,073	651
1922-23	127,151	67,904,224	534	68,349	54	46,956,565	687
1923-24	138,086	73,963,165	535	73,338	53	50,299,884	685
1924-25	148,905	76,419,498	513	77,132	51	51,695,291	670
1925-26	154,322	81,623,788	529	81,669	53	56,102,434	687
1926-27	156,847	82,161,809	524	81,749	52	55,677,261	681
1927-28	149,971	76,896,131	513	77,171	51	51,931,633	673
1928-29	144,812	75,948,485	524	74,171	51	51,207,594	690
1929-30	140,266	75,293,001	537	71,432	51	50,766,464	711
1930-31	137,866	75,357,035	547	71,480	52	51,386,105	719
1931-32	135,912	73,793,049	543	70,826	52	50,243,265	709
1932-33	135,902	73,422,655	540	73,328	54	51,300,933	700
1933-34	141,325	76,274,826	540	74,493	53	52,423,417	704
1934-35	148,426	82,661,157	557	76,178	51	55,921,162	734

* Before 1924-25 the average yield was calculated at the equivalent of 10½ lb. to a gallon, and subsequently at 10⅔ lb.

Individual herds with average yields for full-year cows of 8,000 lb. (774 gal.) or over, numbered 1,504 or 35 per cent. of the total number of herds recorded for the full year, as compared with 1,193 (28 per cent.) in 1933-34. The number of herds with averages of over 10,000 lb. (968 gal.) per cow also showed a considerable increase, being 304 against 254 in 1933-34, while 24 herds had average yields of over 13,000 lb. (1,258 gal.). Some examples of the increases that have been effected in the average yields of individual herds since recording was begun are shown in Table XIII.

The standard yield of their breed or type was reached by 22,082 cows as against 17,905 in 1933-34 (Table XIV). Shorthorn cows that gave 9,000 lb. of milk or over, increased from 8,316 to 10,192, and Friesians that gave 10,000 lb. or over increased from 4,818 to 5,796. There were relatively larger increases in the number of Ayrshires, Guernseys,

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TABLE XIII.—STANDARD YIELDS OF BREEDS OR TYPES

Herd	No. of years during which records have been taken	Average yield per cow in first year	Average yield per cow in last year	Increase in annual average yield per cow	No. of full-year cows in last year of period	Cash value of increase of last year over first year at 1s. per gallon	
						Per cow	Per herd
A (Non-Pedigree Shorthorn)	18	524	892	368	49	18 8	901 12
B (Pedigree Jersey)	5	663	1,045	382	33	19 2	630 6
C (Pedigree Friesian)	7	802	1,202	400	28	20 0	560 0
D (Pedigree Friesian)	11	628	1,058	430	22	21 10	473 0
E (Non-Pedigree Shorthorn)	9	845	1,072	227	22	11 7	249 14

TABLE XIV.—NUMBER OF COWS THAT GAVE THE STANDARD YIELD PRESCRIBED FOR THEIR BREED OR TYPE DURING THE YEAR ENDED OCTOBER 1, 1935, CLASSIFIED ACCORDING TO BREED AND YIELD.

Breed or Type	Standard yield	Yields (in lb.)									Total number of cows giving the standard yield
		8,000 to 9,000	9,000 to 10,000	10,000 to 11,000	11,000 to 12,000	12,000 to 14,000	14,000 to 16,000	16,000 to 20,000	Over 20,000		
Ayrshire ..	lb. 9,000	—	458	268	142	79	31	7	2	987	
Blue Albion ..	9,000	—	37	21	20	17	6	2	—	103	
Devon ..	8,000	42	11	7	4	4	—	—	—	68	
Friesian ..	10,000	—	—	1,951	1,312	1,558	586	321	68	5,796	
Guernsey ..	8,000	1,065	585	299	134	81	12	4	—	2,180	
Jersey ..	8,000	494	236	146	67	59	10	3	—	1,015	
Lincoln Red Shorthorn	9,000	—	118	62	40	27	6	1	—	254	
Red Poll ..	9,000	—	439	265	151	119	31	7	2	1,014	
Shorthorn ..	9,000	—	4,728	2,704	1,407	1,027	235	84	7	10,192	
South Devon ..	8,000	115	88	44	23	15	4	1	—	290	
Welsh Black ..	8,000	26	11	2	9	6	1	—	—	55	
Other Breeds ..	8,000	*67	25	18	12	6	—	—	—	128	
TOTALS ..	—	*1,809	6,736	5,787	3,321	2,998	922	430	79	22,082	

* Includes 15 Dexter cows with yields of 7,000 to 8,000 lb. (Standard yield for Dexters is 7,000 lb.)

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Jerseys and Red Polls, which reached the standard yields of their breeds. The number of cows that gave over 10,000 lb. (968 gal.) was 13,537, an increase of 2,685 over the previous year, and 79 of these gave over 20,000 lb. (1,935 gal.) against 74 in 1933-34. The highest yield during the year was 30,220 lb. (2,925 gal.) given by a Friesian owned by a member of the Essex Society.

The number and average yield of cows of certain breeds recorded in 1934-35 are given in Table XV. As compared with 1933-34 there was an increase of 2,801 in the number of Shorthorns recorded, and Ayrshires, Friesians and Guernseys all showed increases of over 1,000. All the breeds recorded shared in the general increase in the average yield of milk. Shorthorns averaged 7,318 lb. against 7,009 lb. in 1933-34, and Friesians averaged 9,291 lb., an increase of 384 lb. on the year. The average yield of Lincoln Reds was only a little higher on the year, but Ayrshires, Blue Albions, Devons, Guernseys, Jerseys, Red Polls, South Devons and Welsh Blacks all showed increases of 200 lb. or more.

TABLE XV.

Breed or type	Total number of cows and heifers recorded	Particulars of cows recorded for full year			
		Number	Percentage of total of cows and heifers	Total yield	Average yield
Ayrshire ..	6,636	3,278	49·3	lb. 24,630,657	lb. 7,514
Blue Albion ..	508	303	59·6	2,356,772	7,778
Devon ..	744	470	63·1	2,943,101	6,262
Friesian ..	24,687	13,438	54·4	124,859,095	9,291
Guernsey ..	13,050	6,224	47·6	42,892,467	6,891
Jersey ..	7,834	3,797	48·4	25,194,016	6,635
Lincoln Red ..	2,062	1,050	50·9	7,501,612	7,144
Red Poll ..	6,489	3,742	57·6	28,399,825	7,589
Shorthorn ..	82,440	41,726	50·6	305,361,996	7,318
South Devon ..	1,827	917	50·1	6,214,608	6,777
Welsh Black ..	724	434	59·9	2,539,591	5,852

Issue of Certificates. A record number of Certificates of Merit was issued during the year. Certificates issued in respect of the three years ended October 1, 1935, numbered 665, as compared with 562 for the previous three-year period. In addition, 57 Certificates of Merit were issued during the

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year in respect of earlier periods. Certificates of Merit are awarded, on application by the owner, and on payment of a fee of 5s. per certificate, for cows that have given during a period of three consecutive Milk Recording Years the prescribed yield of milk for their breed or type and have been shown to be regular breeders. The number of members of Milk Recording Societies who obtained Certificates of Merit was 206, an increase of 24 on the year. Certificates issued in respect of the three-year period ended October 1, 1935, numbered 171 for Shorthorns, an increase of 34; 120 for Guernseys, an increase of 35; 117 for Red Polls, an increase of 23; 93 for Jerseys, an increase of 30; but Friesians with 126 showed a small decrease. The highest yields certified for the various breeds were:—Friesian, 67,708 lb.; Shorthorn, 57,655 lb.; Red Poll, 51,827 lb.; Jersey, 49,585 lb.; and Guernsey, 39,920 lb. In addition, it may be mentioned that a Certificate for the period ended October 1, 1934, was issued during the year in respect of a Friesian cow that yielded 71,849 lb. of milk, the highest yield which has ever appeared on a Certificate of Merit. Only one Certificate of Milk Record was issued during the year as compared with 7 in 1934-35.

Register of Dairy Cattle. Volume XIX of the Register of Dairy Cattle was published in June, 1936, and contains particulars of the 722 cows in respect of which Certificates of Merit have been issued since the publication of Volume XVIII, and also particulars of 21 pedigree bulls that qualified for entry on the basis of the yields given by their dams and sires' dams.

Calf and Bull Marking. The number of calves marked under the Ministry's Scheme for the earmarking and registration of calves of milk-recorded cows was 15,233, an increase of 462 over the number for the previous year. Although 90 per cent. of the total were heifers, the number of bull calves marked constitutes a record, and at 1,448 was 150 more than the corresponding number for 1933-34.

The number of bulls being used for service, and which were earmarked and registered by Societies for their members, shows a decline to 32 against the previous total of 41.

Testing for Butter-Fat. The Ministry's Scheme for Butter-Fat Testing made some progress during the year, the number of members having cows tested being 854 against 759 a year ago. Testing was carried out in 924 herds containing over 28,000 cows, the number of cows actually tested being 11,583

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as compared with 9,959 in 1933-34. The Scheme has worked smoothly, but the extra cost of taking regular individual samples seems to act as a deterrent to the commercial farmer, as over 81 per cent. of the herds tested consisted wholly or mainly of pedigree cattle. Table XVI shows the number of cows of each breed whose milk was tested under the Ministry's Scheme during the year.

TABLE XVI.—NUMBER OF COWS TESTED FOR BUTTER-FAT UNDER THE MINISTRY'S SCHEME DURING THE YEAR ENDED OCTOBER 1, 1935, CLASSIFIED ACCORDING TO BREED AND PERCENTAGE OF BUTTER-FAT.

Breed or type	Percentage of Butter-fat									Total number of cows tested	Average percentage of butter-fat
	Under 3	3 to 3·5	3·5 to 4	4 to 4·5	4·5 to 5	5 to 5·5	5·5 to 6	Over 6			
Ayrshire ..	21	219	467	176	20	3	—	—	906	3·71	
Friesian ..	566	1,593	661	81	6	1	—	—	2,908	3·26	
Guernsey ..	4	13	224	743	997	507	126	25	2,639	4·63	
Jersey ..	3	9	40	207	377	382	198	80	1,296	4·86	
Lincoln Red ..	4	86	61	21	3	1	—	—	176	3·54	
Red Poll ..	25	177	300	130	17	—	—	1	650	3·65	
Shorthorn ..	142	1,018	1,304	321	32	4	1	—	2,822	3·56	
Other Breeds ..	2	23	67	65	25	4	—	—	186	3·97	
TOTALS ..	767	3,138	3,124	1,744	1,477	902	325	106	11,583	3·84	

Friesians, Shorthorns, Guernseys and Jerseys accounted for over 80 per cent. of the animals tested, the only other breeds that were tested in any considerable numbers being Ayrshires and Red Polls. The number of cows that averaged over 5 per cent. of butter-fat was 1,333, nearly all of which were Guernseys or Jerseys, as compared with 1,190 last year, while 3,221 averaged between 4 and 5 per cent. and 6,262 between 3 and 4 per cent. against 2,953 and 5,304 respectively in 1933-34. The average percentage of butter-fat of all the animals tested was 3·84, a small decrease as compared with the previous year, and there was a corresponding decrease in the average percentage of each of the principal breeds tested. Jerseys again obtained the highest average with 4·86 per cent., while Guernseys averaged 4·63 per cent.; Ayrshires 3·71 per cent.; Red Polls 3·65 per cent.; Shorthorns 3·56 per cent., and Friesians 3·26 per cent.

Rationing. The practice of feeding individual cows according to their yields continues to become more extensive amongst members of Milk Recording Societies, and reports

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TABLE XVII.—MILK RECORDING SOCIETIES.

STATEMENT GIVING PARTICULARS OF THE 49 MILK RECORDING SOCIETIES OPERATING
DURING THE YEAR ENDED OCTOBER 1, 1935.

(The Societies are arranged in order of total numbers of Cows recorded.)

Society	*No. of Members	*No. of Herds	Total No. of Cows recorded	No. of Cows recorded for full year	Average yield of Cows recorded for full year
Essex County	228	271	11,150	5,789	8,507
Suffolk	303	344	9,975	5,212	8,128
East Sussex	230	271	8,925	4,570	6,990
Hampshire	191	225	7,883	4,053	7,317
Berkshire	165	195	7,028	3,704	7,350
Somerset and North Dorset	170	200	6,720	3,819	7,411
Norfolk	194	215	6,433	3,949	8,081
Hertfordshire County	180	198	6,163	3,320	7,689
Kent	133	158	4,928	2,393	7,343
West Sussex	121	135	4,759	2,351	7,554
Surrey	138	148	4,356	1,917	7,411
Lancashire County	107	115	4,284	1,648	8,041
North Wilts	74	89	3,876	2,232	7,162
Gloucestershire	112	122	3,522	1,923	7,677
Yorkshire	110	114	3,298	1,274	8,099
Oxfordshire	86	95	3,205	1,773	7,532
Buckinghamshire	99	107	3,095	1,539	7,603
Leicestershire and Rutland	82	87	2,910	1,362	7,123
Warwickshire	99	103	2,877	1,438	7,695
Cambridgeshire and District	80	91	2,750	1,328	7,095
Shropshire	65	67	2,647	1,251	7,185
Dorset	45	63	2,588	1,560	7,204
Staffordshire	70	72	2,532	1,351	7,804
Northamptonshire	66	73	2,400	1,157	6,998
Bristol and North Somerset	72	77	2,227	1,277	7,132
Nottinghamshire	49	51	2,190	979	7,668
Cumberland and North Westmorland	82	84	2,085	869	6,299
Cheshire County	52	55	2,066	997	7,597
South Wilts	32	41	1,943	1,223	7,854
South Devon and District	88	89	1,898	923	6,787
Bedfordshire	54	55	1,774	888	7,863
Derby and District	50	51	1,716	830	8,670
Durham County	51	53	1,546	743	7,538
Worcestershire	54	55	1,424	662	7,643
Peak (Derby)	50	51	1,383	568	8,095
Northumberland	42	47	1,383	719	7,432
Lincolnshire	28	30	1,246	631	7,589
East Devon	52	52	966	573	6,833
Kendal and South Westmorland	35	36	922	382	6,500
Cornwall	45	45	764	400	6,750
Monmouthshire and Brecon	30	30	736	368	7,787
Campden, Moreton and Dist. (Glos.)	29	29	731	416	7,331
Denbighshire and Flintshire	26	26	646	374	6,895
Anglesey and Caernarvonshire	46	46	638	386	5,638
Carmarthenshire	21	22	601	330	7,786
Herefordshire	21	21	418	220	7,968
Cardiganshire	22	22	332	187	6,860
Glamorgan	14	14	251	147	8,409
Pembrokeshire	14	14	236	167	6,958
TOTALS	4,212	4,654	148,426	76,178	7,586

* Herds of Goats are not included.

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received by the Ministry indicate that in some Societies all the members now pay strict attention to rationing. Advice is usually obtained from the County Agricultural Organizers.

Cost of Milk Recording. There was a small reduction in the average cost of milk recording, per cow, over the whole country. The average amount paid by members of the Societies was 4s. 2d. per cow, while the Ministry's grants averaged 1s. 10d. per cow, as compared with 4s. 3d. and 1s. 11d. respectively in 1933-34.

NOTE.—Detailed information concerning the Ministry's Live Stock Improvement Scheme is given in the following memoranda, copies of which may be obtained (single copies free of charge) on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1 :—

Form No. A763/T.L.—Scheme for the Improvement of Live Stock.

Form No. 609/T.L.—Bull Grant Regulations.

Form No. 466/T.L.—Boar Grant Regulations.

Form No. 89/T.L.—Heavy Horse Regulations.

Form No. 392/T.L.—Milk Recording Regulations (including the Butter-fat Testing Regulations and the Regulations relating to the Progeny Recording of Dairy Bulls, which are printed as separate pamphlets).

Form No. A899/T.L.—Guide to the Licensing of Bulls in England and Wales.

WEEDS

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SCIENTIFIC research is now applied to everything, and weeds have come in for their share of investigation. Some species have been transformed into valuable plants; but, for the most part, weed destruction has been compassed by all the ingenuity of man. Weeds have been attacked from all angles: they have been the subject of legislation; and they have been fought by mechanical, by chemical, and by biological methods, from the ground and from the air.

Modern Seeds and Noxious Weeds Acts attack weeds through education, by encouraging the use of clean seed, by prohibiting the sowing of the seeds of weeds, and by the compulsory destruction of noxious weeds. The mechanical methods used vary from the use of the primitive wooden implement to the gigantic roller that crushes acres of Mallee Scrub a day. Modern implements, better, cheaper and quicker methods using the power of the internal combustion engine, have accelerated weed-destruction enormously. With machinery, one man in Queensland can turn over and destroy fifty acres of weeds in a day.

Chemical attack is becoming commoner and more effective every season. The ordinary method employed is to spray the weeds with poison, and this has been done on foot, by tractor, by car, and by aeroplane. Huge areas can be quickly and inexpensively treated, but it is of great importance that stock should be able to feed over the poisoned area with impunity.

The biological methods employed against weeds are numerous, and in Queensland provide one of the most successful instances of the application of science to weed destruction. Millions of acres of land were rendered worthless by the growth of a particularly obnoxious weed, Prickly Pear, a cactus, useless for stock feed because of its hard, sharp spikes. By the introduction of a small insect, *Cactoblastis cactorum*, quite out of proportion to the length of its name, this land has been entirely cleared of the weed

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and is now utilized for agriculture. The writer spent years fighting this weed by the then known methods, viz., by making numerous incisions in the plant and inserting arsenic therein; and later by the improved method, subsidized by the Queensland Government, of spraying the plants with an atomized mixture of sulphuric acid and arsenic pentoxide. The former method proved useless, and the latter was only temporarily successful. Some idea of the physical labour involved can be realized from the fact that one thickly infested "paddock" had an area of 10,000 acres, and the rest of the holding—some 48,000 acres—had to be combed for scattered infestations. At that time the weed was spreading at the rate of a million acres per annum. Then the biologist discovered the insect for us, and this has further enhanced its reputation by ignoring every other plant but the prickly pear. Now, armed with a small box containing thousands of eggs of the insect—the first eggs were obtained from insects bred in the laboratory—the farmer goes among the prickly pear and pins a few eggs to a leaf here and there. The eggs hatch out and the resultant grubs eat out the inside of the entire plant, leaving a dry, dusty shell. The life history of the insect is repeated twice yearly—the newly-hatched insects fly in myriads to the nearest growing prickly-pear plants and lay their eggs; and thus, from the original "inoculation," millions of acres have been cleared. The great difficulty in applying this method of destruction to other noxious weeds is the finding of insects that will confine their attentions respectively to a single species of weed and not attack other plants.

A flame-throwing implement that will scorch up weeds has also been employed with success, and has the additional advantage that both plant and seed are destroyed. Weeds, however, still persist, and always will, because, after all, they are but plants out of place. If weeds have given us our best and most useful plants, some of our most highly-cultivated plants have become our worst weeds. One cannot but admire the life histories of weeds. Spurned by all and cast out of cultivation, the weeds come up, showing greater tenacity of life and a more vigorous growth than cultivated species, seeding sooner and more prolifically.

I like the dictionary definition of the word "weed" as a "useless and harmful plant," for it exonerates the buttercup in my pasture land, my poppy in the arable land, and my

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daffodils—at least partially—from the stigma of the definition. Who could describe the beauty of the yellow buttercup in the green meadow, the splash of red of the poppy among the golden grain, or a field of waving daffodils, as useless and harmful? Yet, I suppose that a pasture all grass, a grain crop all grain, and the daffodils in nice straight rows in the garden or under field cultivation, would be more in keeping with the steel pylons of an efficient age.

The destruction of weeds was, doubtless, among the first cultural efforts of our ancestors. That the benefits of weed destruction were early realized we know from Columella (first century), who, in his *De re Rustica*, states: “if these [weeding and sarching—a kind of hoeing] are neglected the produce of the fields will be greatly diminished—in my opinion, he is a very bad farmer who allows weeds to grow along with the corn, for the produce will be greatly lessened if weeding is neglected.”

Yet, in Saxon times—in fact, until the introduction of root crops (turnips, mangolds, etc.) and the Norfolk rotation of crops—the common custom was to depend on weeds for summer feed. In the seventeenth century, Sir Thomas Browne wrote: “a rural charm against Dodder, Lettice and Strangling Weeds is by placing a chalked Tile at the four corners and one in the middle of the field.” One can only regret that it was not stated how effective this inexpensive method proved! We know, however, that dodder is still a noxious weed, and its presence in seed is controlled in Britain under the Seeds Act of 1920.

In Scotland, from whose sturdy, independent tenant-farmers originated so many advances in the practice of agriculture, a Statute for the eradication of weeds existed as early as the thirteenth century.

It was a Statute* of Alexander II of Scotland (1214-1249) that ordered:—

De manaleta.—Of Guld.† Gift the malar [tenant] puttis guld in thi land and will nocht delieur it and clenge it he aw to be punyst as he that ledis anc host in the kingis lande or the barounis [puniri sicut seductor qui ducit exercitum in terra domini Regis vel baronis].§

De manaleta in terris.—Of Guld in corn. And gif thi natiff man or thi bonde [servant] haf fylit [fouled] thi land with guld for ilk [every] plant of it he sall gif to the or ony other lord a mutone [wether sheep] to be forfalt [forfeited] and neuer thi les he sal clenge thi land of thi guld.

* *The Acts of the Parliaments of Scotland*, ed. 1844, Vol. I, pp. 750, 751.

† Corn Marigold (*Chrysanthemum segetum*).

§ i.e., he should be hanged.

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This is a concise and very clear Act—judging from the penalties to be exacted for commission or omission, an Act likely to receive careful attention. According to Sir John Sinclair's *System of Husbandry* :*

They seem to have paid more attention formerly, at least in some parts of Scotland, to the extirpation of annual weeds, than is thought at present. It is recorded that an intelligent landlord, Sir William Grierson, was accustomed to hold *Goul* (*chrysanthemum*) courts for the express purpose of fining farmers on whose crops three heads, or upwards, of that weed were found. Such a practice, if generally adopted, would soon extirpate annual weeds.

A better description of the working and effect of the old Act will be found in *The Statistical Account of Scotland*,† drawn up from the communications of the Ministers of the different parishes by Sir John Sinclair. Referring to the Parish of Cargill, Perthshire, it states :

An old custom takes place in this parish, called *Gool-riding*, which seems worthy of observation. The lands of Cargill were formerly so very much over-run by a weed with a yellow flower that grows among the corns, especially in wet seasons, called *Gool*, and which had the most pernicious effects not only upon the corns while growing, but also in preventing their winning [drying] after cut down, that it was found absolutely necessary to adopt some effectual method of extirpating it altogether. Accordingly, after allowing a reasonable time for procuring clean seed from other quarters, an act of the baron-court was passed, enforcing an old Act of Parliament to the same effect, imposing a fine of 3*s.* 4*d.* or a wedder sheep, on the tenants, for every stock of gool that should be found growing among their corns at a particular day, and certain persons, styled *gool-riders*, were appointed to ride through the fields, search for the gool, and carry the law into execution when they discovered it. Though the fine of a wedder sheep, originally imposed for every stock of gool found growing in the barony, is now commuted and reduced to 1*d.* Sterling, the practice of gool-riding is still kept up, and the fine rigidly exacted. The effects of this baronial regulation have been salutary, beyond what could have been well expected. Five stocks of gool were formerly said to grow for every stock of corn through all the lands of the barony, and twenty theaves of barley did not then produce one boll. Now the grounds are so cleaned from this noxious weed, that the corns are in high request for seed ; and after the most diligent search, the gool-riders can hardly discover as many growing stocks of gool, the fine for which will afford them a dinner and a drink.

After 700 years, our weed legislation is substantially the same as that of our less scientific ancestors. Modern methods may make weed control very much easier, but one wonders whether our most exacting inspectors would compare favourably with the old gool-riders in " getting things done."

* Ed. 1814, Vol. I, p. 358.

† Ed. 1794, Vol. XIII, pp. 537 and 538.

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In many countries, the control of noxious weeds is vested in the local authorities, who can order the destruction of any noxious weeds within a given period and, in the event of failure to comply with such orders, can do the work themselves and recover the cost from the owners. In the United States of America, failure to comply with an order to clear renders the owner of the infested land liable to a fine of 5 dollars per day until the clearing is completed, and the cost is added to the tax roll and recoverable as are other taxes on the land.

MILK-PRODUCTION COSTS AT THE AGRICULTURAL RESEARCH INSTITUTE OF NORTHERN IRELAND

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At the present time, when the profitability of milk production is a common topic of public and private debate, any actual costs are likely to be of general interest. It is hoped that the figures presented in this article concerning the expenditure incurred in the milk-production enterprise on the 500-acre farm of the Agricultural Research Institute of Northern Ireland will provide a useful example of the way in which costs have worked out in practice during recent years.

It is, of course, dangerous to attempt to draw broad and general conclusions from costs on one farm. The conditions affecting the particular case have to be kept constantly in mind, so that the presentation of the figures must be prefaced by a description of the herd in question. The accounts were begun in the spring of 1928, when the herd was founded by the calving of a number of bought-in heifers. After that the herd was built up by breeding and purchase until it numbered between 60 and 70 cows in 1932, at which size it has since been maintained. It consists of cross-bred Shorthorns, mated to pedigree dairy bulls. On the whole, the cows are of good size and type, and have given quite satisfactory milk yields commercially, as instanced by the fact that quite a number of lactation yields of 1,000 gal. and over have been recorded in the herd. At the end of the period under review, there were, indeed, 16 cows in the herd that had reached the 1,000 gal. standard. One home-bred heifer had the distinction of winning the cup for the best recorded first-calf heifer in Northern Ireland in 1934. Grade A, tuberculin tested, milk has been produced from the foundation of the herd, and the Institute consistently did well in the Northern Ireland clean-milk competitions, winning the first place in 1933.

The herd has been maintained free from tuberculosis with relatively little difficulty. Twenty-seven cows failed in the tuberculin tests during the eight years, but probably only

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seven of these actually became infected while in the herd. Twenty out of the twenty-seven failures occurred in cows undergoing their first regular test after coming into the herd, and, although they had passed the test before coming into the herd, as, of course, all new cows have to do, it seems likely that they were already infected when they were bought. Only four cows died during the eight years, from various causes, and the only serious disease experienced was an outbreak of contagious abortion in the summer of 1930 which affected most of the cows in the herd during the following three years.

While a number of experimental observations have been made on the milk, and the herd has been used to test different methods of combating contagious abortion, the only experimental work that makes the feeding and management of the herd at all different from ordinary good commercial practice is the addition of a mineral mixture to the concentrate ration of half the cows. This experiment has had no effect on the costs and production of the herd, so that the figures given here may be considered as applying to a purely commercial enterprise.

Apart from the character of the herd, it is extremely important to bear in mind the methods of computing the costs. The general principle of the Institute accounts is that each enterprise is charged only with the costs that are clearly incurred for it. Arbitrary methods of allocating costs and estimating values are, as far as possible, avoided. For this reason, no credits are allowed to the milk account for manurial values of feeding stuffs and no value is put on newly-born calves, which are regarded as a by-product in dairy farming. Also no attempt is made to debit the various departments of the farm with proportions of overhead costs and rent, since any method of allocating these charges always entails arbitrary assumptions.

The costs here presented are thus "prime costs" and in respect of some items will not be comparable with costing results of the type more frequently presented. "Prime costs" have the advantage that each item in them represents a definite material or service provided for the cows. Such costs must, however, be used with caution if they are to be compared with returns, and if estimates are to be made of possible profits on milk production. The surplus of returns over prime costs on the milk-production enterprise has to be set, along with surpluses or deficits on other enterprises,

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against the rent and overhead costs on the farm as a whole. The rent and overheads have to be more than met by the net surplus on the farm before the farm, as a whole, shows a profit.

With these general considerations in mind, the cost figures may be presented and explained in detail. The figures are given for each year from 1928-29 to 1935-36. The Institute accounting year commenced on March 1 in the first three years of this period, and on April 1 in the later years, but this change of date hardly affects the comparisons given here. Since the herd was changing in size throughout the greater part of the period, it is necessary to reduce the costs to averages per cow, as set out in Table I, so that they may be comparable from year to year. The average number of cows in the herd during each year is really an average of the number of cows in the herd on each day of the year. It is thus an accurate average, but, of course, there is a certain amount of roughness in the average costs for the years when the number of cows in the herd was increasing rapidly. The average costs, will, in general, be increased by this difficulty, since the number of cows in the herd during the winter, when costs are highest, will be greater than the average number for the year.

In calculating the depreciation on the herd, the cows are valued at a standard rate each year, so that when the numbers at the valuation date do not change, the depreciation represents the difference between the cost of new cows and heifers brought into the herd and the price realized for cows going out of the herd. The high depreciation in the earlier years may be attributed to the cost of founding the herd and to the writing down of the book value of the cows to the standard valuation of £22. In 1934-35 the effects of the outbreak of abortion were being felt in the number of cows that had to be sold out of the herd because of sterility. Bulls are depreciated from their purchase price to their selling price as evenly as possible over their time in the herd. Home-bred heifers coming into the herd are valued at a standard rate of £15 per head. The depreciation on the herd would have been increased if they had been brought in at a cost figure, which would have been something like £19.

The labour costs ("wages and horse labour") include all costs of tending, feeding, and milking the cows. They are higher than the costs that would be incurred on a farm not

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TABLE I.—AVERAGE PRIME COSTS* PER COW.

	1928-29			1929-30			1930-31			1931-32			1932-33			1933-34			1934-35					
	<i>f.</i>	<i>s.</i>	<i>d.</i>																					
Depreciation of Cows ..	9	14	3	2	14	7	5	8	4	5	12	9	3	14	7	4	1	0	5	18	7	3	16	1
Depreciation and Keep of Bulls ..	3	4	6	1	11	8	1	2	9	1	0	7	0	19	7	1	2	8	1	14	0	1	5	10
Wages and Horse Labour ..	9	13	4	8	7	1	7	13	2	6	12	4	4	19	10	5	3	10	5	15	9	5	10	2
Concentrates ..	13	8	4	15	5	0	12	6	10	11	12	7	5	0	9	5	9	0	6	9	0	6	13	10
Coarse Fodder ..	8	8	8	7	0	3	6	1	2	7	9	11	5	7	6	7	14	10	6	11	2	5	11	2
Grazing ..	0	13	5	0	8	4	0	13	1	0	12	9	0	14	3	0	15	5	0	19	5	0	14	0
Tuberculin Tests ..	2	6	4	0	17	8	0	18	6	0	17	8	0	16	4	0	15	1	0	17	6	0	2	2
Sundries ..	2	16	9	2	18	7	4	2	10	2	4	8	2	0	6	1	16	3	2	1	2	2	9	
Dairy Costs ..	50	5	7	39	3	2	38	6	8	36	3	3	23	13	4	26	18	1	30	6	7	25	16	0
	8	12	8	5	17	9	7	4	9	5	18	1	5	6	7	5	2	7	5	3	0	4	14	6
	58	18	3	45	0	11	45	11	5	42	1	4	28	19	11	32	0	8	35	9	7	30	10	6
Average number of cows in the herd during the year ..	19·4			37·3			40·3			57·0			66·6			63·9			63·1			68·2		
Average number of gallons of milk produced per cow ..	798			798			814			794			624			666			703			729		
Pounds of concentrates fed per gallon of milk produced ..	3·36			4·27			4·11			4·66			2·74			3·02			3·17			3·33		
Average price of concentrate mixture per cwt. ..	11	2		10	0		8	3		7	0		6	7		6	1		6	6		6	6	

* Prime costs do not include rent and overhead charges.

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producing Grade A milk, but otherwise may be considered representative. They were obviously reduced by the installation of a milking machine in August, 1931, after which three part-time milkers were dispensed with and all the work on the herd was done by the three regular byremen.

With the exception of home-grown oats, the "concentrates" were all purchased in bulk and mixed on the farm, and are charged at cost. Home-grown oats have been charged, roughly, at prices at which equivalent oats could have been bought. Few changes have been made in the concentrate mixture, and the mixture in use at the end of the period was 6 parts of bruised oats, 6 of maize meal, 4 of maize gluten feed, 2 of bran, 3 of soya bean meal, and 3 of cotton meal.

Very great economies have obviously been made in the feeding of concentrates since the early years of the herd. The figures given at the foot of Table I, showing the number of pounds of concentrates that were actually fed for each gallon of milk produced, give a clear example of the saving that can be effected when a definite method of weighing out the rations to the byre is adopted. Up to 1932, the head byremen was given directions—verbal and written—as to the feeding of the cows, but it became obvious that more than the proper quantities were being fed. To prevent this, the rations were weighed out from the lofts each week, the amount allowed being regulated by the actual production of milk from the herd in the previous week. Generally, this allowance is 3 lb. of the meal mixture for each gallon of milk produced, though this quantity is not required during the early part of the grazing season, and additional allowances have to be made when draft cows are being fattened. The system has worked well and has considerably cut down the consumption of concentrates without in any way affecting the milk yields or the condition of the cows. The cost per hundredweight of the concentrate mixture has also been much reduced during the eight years, owing to the general fall in the price of feeding stuffs. The average costs per cwt. of the mixture fed are shown for each year at the foot of Table I.

The headings "Coarse Fodder" and "Grazing" are self-explanatory, but it may be mentioned that the former covers, chiefly, the cost of hay and turnips, practically the whole of which were home-grown and have generally been

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charged to the cows at 3s. per cwt. and 10s. per ton respectively. Relatively small quantities of straw, cabbage and kale, which have been fed at various times, are also included under this heading. The charge for grazing may appear small if compared with other costs of production prepared on a different basis. Grazing is frequently made to appear very expensive when it has to bear rent and overhead charges, but the figures given here represent merely a proportion of the prime costs incurred for manuring, weeding, and cultivating the pastures allocated to the cows according to the numbers grazing and the time they have been turned out.

The cost of "Tuberculin Tests" up to the end of 1934 includes the veterinary surgeon's fees for the regular bi-annual tests on the herd and for tests on purchased cows before they entered it, but, after the Milk and Milk Products Act came into operation and the regular tests on the herd were carried out by the Ministry of Agriculture (Northern Ireland), this heading covers only the cost of tests on new cows before entering the herd. "Sundries" cover a number of costs that are too small to be worth setting out individually, such as hauling and mixing concentrates, laundering overalls, veterinary attendance on sick cows, medicines, milk record fees, upkeep of the milking machine, and the levies paid to the Milk Council.

The costs given in Table I up to this point represent the costs of keeping and producing milk from an "average" cow, the milk being in the raw state as it leaves the byre. Such costs are unaffected by the way in which the milk is disposed of, and are comparable with those on any other farm that produces Grade A milk. The actual costs of disposing of the milk on the Institute farm are given under the heading "Dairy Costs," and refer, of course, purely to conditions at the Institute and to the particular methods of disposal practised. The bulk of the milk is bottled, and these costs include the washing and sterilizing of the bottles and the bottling of the milk. A considerable proportion of the milk is separated and the cream sold wholesale, but surplus cream at flush seasons is made into butter in the dairy. All the sales are to distributors, except that Institute employees are supplied.

Each cow's milk is weighed twice daily at each milking, so that the total production is obtained accurately. The average yield per cow, as given in Table I, is obtained by

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dividing the total production for the year by the average number of cows in the herd during the year. It is, hence not quite the same as an average of lactation yields, but is a figure that more clearly represents the average efficiency of the herd, since it is affected by the length of dry periods. It is the average production per cow per year, rather than the average yield per lactation, that affects costs. The effect of the outbreak of contagious abortion in reducing lactation yields, and also in increasing dry periods by causing many cases of difficulty in breeding and of sterility, is reflected in the lower average milk yields obtained after 1932.

The figure for average costs per cow is reduced to average cost per gallon of milk produced, under the same headings, in Table II. It will be seen from this table that the costs per gallon varied in much the same way, from year to year, as the costs per cow, but the fall in the costs of labour and of feeding stuffs about 1932, is not so marked. The reason for this is, of course, that the milk yields fell at the same time that costs per cow were reduced, though not in so great a proportion.

The figures in the form of costs per gallon will probably make a greater appeal to the interests of dairy farmers than the average costs per cow, since they are more easily compared with the returns side of the milk-production account. Farmers know the price they are getting per gallon of milk, while they seldom know their average returns per cow. Hence it may be as well to emphasize again that the figures in this article represent only "prime costs," and that the milk would have to realize a considerably higher return per gallon than these costs before the milk enterprise could be considered worth pursuing on the farm. On the average, during the past four years, the milk on the Institute farm has cost just about $11\frac{1}{2}d.$ per gallon in prime costs. It is, of course, impossible to say exactly how much higher than this cost the average returns would have to be to yield a satisfactory surplus. If, however, one considers the proportion of the total farm expenses that are attributable to milk production, and assumes that the milk production account should bear a similar proportion of rent and overhead charges, it appears that the surplus has to reach something like $4d.$ per gallon on this farm before "profits" can begin to be made on milk production.

In this connexion, it must also be remembered that it is

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TABLE II.—AVERAGE PRIME COSTS* PER GALLON OF MILK PRODUCED, IN PENCE

	1928-29	1929-30	1930-31	1931-32	1932-33	1933-34	1934-35	1935-36
Depreciation of Cows ..	2.92	0.82	1.60	1.70	1.43	1.46	2.02	1.25
Depreciation and Keep of Bulls ..	0.97	0.49	0.34	0.31	0.38	0.41	0.58	0.43
Wages and Horse Labour ..	2.91	2.51	2.26	2.0	1.92	1.87	1.98	1.81
Concentrates ..	4.04	4.58	3.64	3.51	1.94	1.96	2.20	2.20
Coarse Fodder ..	2.54	2.10	1.79	2.27	2.07	2.79	2.24	1.83
Grazing ..	0.20	0.13	0.19	0.19	0.27	0.28	0.33	0.23
Tuberculin Tests ..	0.70	0.26	0.27	0.31	0.27	0.30	0.04	
Sundries ..	0.85	0.88	1.21	0.67	0.77	0.65	0.71	0.71
Dairy Costs ..	15.13 2.60	11.77 1.77	11.30 2.15	10.92 1.79	9.09 2.05	9.69 1.85	10.36 1.76	8.50 1.55
	17.73	13.54	13.45	12.71	11.14	11.54	12.12	10.05

* Prime costs do not include rent and overhead charges.

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mainly through milk production that the cost of crops and of rearing heifers is recouped. The prices at which home-grown crops have been charged to the milk account were, in most years, not high enough to cover the actual prime costs of cropping on the farm as a whole, so that on crops there is generally a deficit that must be met out of the surplus on milk. Moreover, the home-bred heifers brought into the herd, as mentioned already, cost more to rear than the standard rate of £15 at which they were transferred to the herd in the books, causing another deficit—in the store cattle account—which has to be met out of the surplus on milk.

It is believed that the figures given in this article, subject to the many unavoidable qualifications as to methods of computation, represent reasonable prime or direct costs of milk production, under practical farming conditions. It is hoped that they will be of interest to farmers for comparison with their own results, and will provide others interested in agriculture with an idea of the general level of milk production costs and of the kind of variations to which they are subject under the vicissitudes of farming.

CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS, 1934 TO 1936: NUMBER, WEIGHT AND PRICES OF CATTLE CERTIFIED FOR PAYMENTS

In this JOURNAL for May, August and November, 1935, and May, 1936, information was given regarding the cattle and carcasses of cattle certified for payments under the Cattle Industry (Emergency Provisions) Acts, 1934 and 1935, during the first eighteen months of the Scheme. Similar information is now available for the six months March to August, 1936, and in this article the particulars for these months are set out on similar lines to those previously published and are compared with the data for the corresponding period a year earlier.

As mentioned in the previous reports, the classes of cattle in respect of which payments are made are steers, heifers and cow-heifers; a cow-heifer is defined as an animal which has calved and which has grown not more than six permanent incisor teeth. The standard required, from September 1 to December 31, 1934, was that an animal should have an estimated killing-out percentage of not less than 52 per cent., and, from January 1, 1935, a killing-out percentage of not less than 54 per cent. has been required.

Table I shows the total number of cattle certified in each month from September 1, 1934, when the Scheme came into operation, to August 31, 1936.

It will be noticed from the table overleaf that there were increases in each quarter of 1935-36 as compared with the corresponding quarter of 1934-35, the increase being relatively greatest, 17 per cent., in the autumn of 1935, and least, 3 per cent., in the spring of 1936. Over the whole twelve months, 9½ per cent. more animals were certified in the second year of the Scheme than in the first year.

As regards the different classes of animal, increases in the second year of the scheme were higher in the case of heifers and cow-heifers, with increases of 13½ and 19½ per cent., respectively, than in the case of steers, where the increase was only 6½ per cent.

As has been pointed out in previous articles, the rate of marketing of fat cattle from month to month cannot be judged accurately from the figures in the table above. The figures for each month have, however, been adjusted in order to allow comparison in the rate of marketing from month to

CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS, 1934-36

TABLE I

	STEERS No.		HEIFERS No.		COW-HEIFERS No.		TOTAL No.	
	1935-36	1934-35	1935-36	1934-35	1935-36	1934-35	1935-36	1934-35
September	74,581	62,104	63,248	49,534	4,521	3,792	142,350	115,430
October	77,652	69,276	65,826	58,466	4,558	4,592	148,056	132,334
November	66,745	58,411	60,529	50,749	4,702	4,131	131,970	113,291
Total : September to November	218,978	189,791	189,603	158,749	13,781	12,515	422,362	361,055
December	74,866	63,638	58,539	52,083	4,410	3,832	137,845	118,553
January	83,831	82,094	54,066	51,862	5,663	4,953	143,560	128,909
February	85,380	77,696	47,629	41,212	5,423	4,421	138,432	123,329
Total : December to February	244,107	223,428	160,234	144,157	15,496	13,206	419,837	380,791
March	99,721	86,708	48,062	39,599	6,051	4,616	153,834	130,923
April	95,833	102,732	41,645	40,917	5,463	4,811	142,941	128,460
May	91,130	96,633	37,433	36,825	5,393	4,655	133,956	128,113
Total : March to May ..	286,684	286,073	127,140	117,341	16,907	14,082	430,731	417,496
June	81,685	75,118	47,729	38,873	6,148	4,391	133,562	118,382
July	65,804	70,977	38,196	55,883	5,990	4,950	129,990	131,810
August	67,846	62,178	62,410	53,383	5,556	4,366	135,912	129,927
Total : June to August ..	215,335	208,273	168,335	148,139	17,794	13,707	401,464	370,119
TOTAL (12 months) ..	965,104	907,565	645,312	568,386	63,978	53,510	1,674,394	1,529,461

month. In these adjusted figures, which are given in Table II, allowance has been made for the fact that a large proportion of fat-cattle markets are held on Mondays, and that the number of markets held decreases day by day as the week proceeds. It will be seen that, in both years, marketings decreased from October to December, followed by a rise in January. In the early months of 1935 there was a rise until April-May, followed by decreases in June and July. The general course was fairly similar in the second year, but marketings were heaviest in February, and decreased marketings began to show in May; a month earlier than in 1935.

TABLE II

	1935-36 No.	1934-35 No.
September	141,030	123,602
October	142,713	119,971
November	138,418	117,709
December	128,763	116,358
January	144,232	133,897
February	148,139	133,355
March	143,732	137,356
April	146,373	138,690
May	140,519	138,763
June	126,686	126,714
July	130,598	119,491
August	133,426	123,387

CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS, 1934-36

Live-weight Certification. Animals certified at Live-weight Certification Centres accounted for 1,627,360 of the total of 1,674,394 animals certified at Live-weight and Dead-weight Centres in the twelve months September, 1935, to August, 1936, an increase over the previous twelve months of 9 per cent.

Table III shows the number of animals certified at Live-weight Certification Centres in England, Wales, Scotland, Northern Ireland and the total for the United Kingdom in the six months March to August, 1936, the period now specially under review, as compared with the same period in 1935. Details of the numbers of each class of animal certified at Live-weight Centres in the six months in each of the agricultural divisions into which the country is divided are given in Table IV.

TABLE III

	March-May				June-August			
	1936		1935		1936		1935	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
England ..	268,031	63·9	262,589	64·5	258,733	66·4	244,374	67·8
Wales ..	15,964	3·8	16,998	4·2	15,502	4·0	13,867	3·8
Scotland ..	101,394	24·2	95,167	23·4	85,973	22·1	74,684	20·7
Northern Ireland	34,119	8·1	32,315	7·9	29,310	7·5	27,732	7·7
TOTAL:								
United Kingdom	419,508	100·0	407,069	100·0	389,518	100·0	360,657	100·0

It will be seen from the above table that the largest proportionate increase occurred in Scotland, where the number of animals certified in March to May, 1936, exceeded the number certified in the corresponding three months of 1935 by 6½ per cent., and in June to August, 1936, the numbers were over 15 per cent. higher than in the corresponding period of 1935. Wales, on the other hand, showed a decrease of over 6 per cent. in March to May, but an increase of over 11½ per cent. in the following three months as compared with a year earlier.

A comparison between the number of animals certified in the different agricultural divisions (Table IV. See pages 784, 785) shows that, while the number certified in England in the

CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS, 1934-36

three months March to May, 1936, was 2 per cent. higher than in the corresponding period of 1935, the Northern Division (Northumberland, Durham and the North and East Ridings of Yorkshire) showed the largest percentage increase with 9·3 per cent., the next largest increase being in the North-Western Division (Cumberland, Westmorland, Lancashire, Cheshire, Derbyshire and Staffordshire) with an increase of 6·2 per cent. The largest decrease (6·7 per cent.) occurred in the South-Western Division (Somerset, Dorset, Devon and Cornwall).

As regards the three months June to August, 1936, the number of animals certified in England was 5·9 per cent. higher than a year earlier. The East Midland Division (Nottingham, Leicester, Rutland, Northampton, Buckingham, Oxford and Warwick) showed relatively the largest increase, 13·2 per cent., while the Northern and North-Western Divisions increased by 9·2 per cent. and 8·5 per cent. respectively. The only reduction occurred in the North-Eastern Division (Norfolk, Lincoln and Yorks East Riding), which showed a decrease of 5·5 per cent.

In Wales, the decrease of 6 per cent. in the number of animals certified in the three months March to May, as compared with the corresponding three months of 1935, was shared almost evenly between the Northern and Southern divisions of Wales, as was the increase of 11½ per cent. in June to August.

Each division of Scotland contributed towards the increase of 6½ per cent. in Scotland in the spring of 1936, compared with 1935, the largest increases being 12·7 per cent. in the South-Eastern Division and 7·9 per cent. in the North-Eastern Division. In the following three months, when 15·1 per cent. more cattle were certified than in June to August, 1935, there was an increase of 30·1 per cent. in the North-Eastern Division and increases of 17·7 per cent. and 17·3 per cent. respectively in the North and North-West Division and the West and South-West Division.

As regards the relative proportions of steers, heifers and cow-heifers certified at Live-weight Centres in the United Kingdom, March to August, 1936, as compared with a year earlier, the comparative statement of percentages in Table V shows that the percentage of steers was less in each of the six months of 1936 than in 1935. Steers in both years formed the highest percentage of the total in May, and the percentage

CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS, 1934-36

of steers fell off rapidly when grass-fed cattle came on the market.

TABLE V

Month	STEERS		HEIFERS		Cow-HEIFERS	
	1936	1935	1936	1935	1936	1935
March ..	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
March ..	64.8	66.1	31.4	30.4	3.8	3.5
April ..	67.0	69.1	29.3	27.7	3.7	3.2
May ..	68.0	69.7	28.1	26.9	3.9	3.4
June ..	60.1	63.3	35.5	33.0	4.4	3.7
July ..	50.3	53.6	45.2	42.7	4.5	3.7
August ..	49.7	51.5	46.3	44.9	4.0	3.6

Dead-weight Certifications. The total number of animals certified at Dead-weight Certification Centres in the six months March to August of 1936 was 23,169 compared with 19,889 in the corresponding six months of 1935. Table VI shows the comparative particulars for each country:—

TABLE VI

Month	England and Wales		Scotland		Great Britain	
	1936	1935	1936	1935	1936	1935
March ..	3,040	3,104	612	430	3,652	3,534
April ..	3,012	2,738	592	453	3,604	3,191
May ..	3,206	3,175	761	527	3,967	3,702
Total : March to May	9,258	9,017	1,965	1,410	11,223	10,427
June ..	2,827	2,638	817	303	3,644	2,941
July ..	3,249	2,578	870	455	4,119	3,033
August ..	2,922	2,801	1,261	687	4,183	3,488
Total : June to August	8,998	8,017	2,948	1,445	11,946	9,462
Total for six months ..	18,256	17,034	4,913	2,855	23,169	19,889

The above figures show that certification on the dead-weight basis increased in the six months by almost 16½ per cent. as compared with 1935, and that the increase was relatively much larger in Scotland, with a rise of 72 per cent., than in England and Wales, where the rise was 7 per cent.

CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS, 1934-36

Average Weight of Fat Cattle. The average live-weight (after a deduction of 28 lb. had been made for subsidy payment purposes) of the cattle certified at Live-weight Centres over the whole of the United Kingdom in the six months March to August, 1936, was 9 cwt. 1 qr. 7 lb., which was 16 lb. less than the average in the corresponding six months a year earlier. The average live-weight for each of the six months was as follows: March, 1936, 9 cwt. 2 qr. 1 lb.; April, 9 cwt. 1 qr. 19 lb.; May, 9 cwt. 1 qr. 6 lb.; June, 9 cwt. 0 qr. 26 lb.; July, 9 cwt. 0 qr. 22 lb.; and August, 9 cwt. 0 qr. 22 lb. With the exception of March, in which the average weight was lighter in 1936 than in 1935 by only 7 lb., the average weights quoted above range from 15 to 23 lb. less than the average weights in the corresponding months a year earlier. From the following comparative statement it will be seen that the reduction in average weight over the six months was greater in cattle certified in Northern Ireland, where the average weight decreased by 22 lb., than in England and Wales and Scotland, where the decreases were 16 lb. and 15 lb. respectively. It will be seen, however (Table VII), that in the three months March to May the average weight in Scotland showed a decrease of only 3 lb., but in June to August the decrease in Scotland was 29 lb.

TABLE VII

	Average weight over 3 months, March to May		Average weight over 3 months, June to August		Average weight over 6 months, March to August	
	1936	1935	1936	1935	1936	1935
	Cwt. qr. lb.	Cwt. qr. lb.	Cwt. qr. lb.	Cwt. qr. lb.	Cwt. qr. lb.	Cwt. qr. lb.
England and Wales ..	9 1 20	9 2 7	9 0 22	9 1 10	9 1 7	9 1 23
Scotland ..	9 3 9	9 3 12	9 2 13	9 3 14	9 2 26	9 3 13
Northern Ire- land ..	8 0 17	8 1 14	8 0 12	8 1 3	8 0 15	8 1 9
United King- dom ..	9 1 18	9 2 4	9 0 23	9 1 14	9 1 7	9 1 23

The average dressed-carcass weights of the animals certified at Dead-weight Certification Centres, details of which are set out in Table VIII, show a decrease of 13 lb. in the average weight of carcasses certified in England and Wales, but there was an increase of 6 lb. in those certified in Scotland.

CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS, 1934-36

TABLE VIII

	Average weight over 3 months, March to May		Average weight over 3 months, June to August		Average weight over 6 months March to August	
	1936	1935	1936	1935	1936	1935
England and Wales	lb. 621	lb. 621	lb. 600	lb. 626	lb. 610	lb. 623
Scotland ..	.. 640	.. 631	.. 632	.. 627	.. 635	.. 629
Great Britain ..	.. 624	.. 622	.. 608	.. 626	.. 616	.. 624

Average Prices of Fat Cattle. The average price per live cwt. of fat cattle certified in the United Kingdom in the six months March to August, 1936, was 37s. 2d. as compared with 35s. 2d. in the corresponding six months of 1935. It will be seen from Table IX that, in all parts of the United Kingdom, the average price of certified cattle was higher than a year earlier, though the increase was less marked in Scotland than in England and Wales and Northern Ireland.

TABLE IX

	England and Wales		Scotland		Northern Ireland		United Kingdom	
	1936	1935	1936	1935	1936	1935	1936	1935
March	s. d. 35 2	s. d. 33 5	s. d. 36 4	s. d. 36 1	s. d. 32 4	s. d. 29 10	s. d. 35 2	s. d. 33 9
April	35 11	33 11	37 0	36 0	31 11	29 8	35 11	34 2
May	36 11	35 5	37 6	37 5	33 1	30 11	36 10	35 7
Three months, March to May	36 0	34 4	37 0	36 8	32 5	30 3	35 11	34 7
June	39 1	36 7	40 3	38 11	35 4	32 4	39 2	36 10
July	38 4	35 10	40 3	40 2	34 1	31 11	38 6	36 6
August	37 4	33 11	40 1	37 7	34 7	31 0	37 9	34 6
Three months, June to August	38 3	35 5	40 2	38 11	34 8	31 9	38 6	35 11
Six months, March to August	37 1	34 10	38 6	37 8	33 5	30 11	37 2	35 2

Prices per cwt., dressed-carcass weight, moved on similar lines, and the average price for the six months March to August, 1936, was 64s. 6d. as compared with 60s. 9d. in the

CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS, 1934-36

TABLE IV.—NUMBER OF CATTLE CERTIFIED FOR PAYMENT UNDER THE CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS AT LIVE-WEIGHT CERTIFICATION CENTRES IN EACH MONTH FROM MARCH TO AUGUST, 1936.*

Agricultural Divisions	Steers						Heifers						
	Mar.	Apr.	May	June	July	Aug.	Mar.	Apr.	May	June	July	Aug.	
ENGLAND (excluding Monmouth)	4,933	5,675	6,201	5,992	4,961	3,835	2,668	2,571	2,318	2,683	2,913	2,609	
	..	16,025	18,099	13,623	8,164	7,139	3,654	3,700	3,584	3,721	3,101	2,972	
	..	1,952	1,677	1,709	1,663	1,606	2,240	7,116	1,647	2,114	2,129	..	
	..	5,014	4,581	4,064	4,146	6,530	7,343	3,507	2,588	2,348	4,614	7,621	
	..	5,749	5,088	4,601	3,695	2,562	2,585	5,042	4,029	3,589	4,471	4,793	
	..	4,062	4,171	3,807	3,187	3,586	3,882	3,999	3,071	2,836	3,863	5,659	
	..	15,272	13,582	13,422	10,237	6,416	7,048	6,735	5,353	4,918	8,332	12,157	
WALES (including Monmouth)	4,465	4,958	3,448	3,090	2,454	2,837	5,230	4,039	3,613	4,912	6,704	8,235	
	..	58,072	56,931	55,254	45,633	36,130	36,275	32,775	27,067	24,853	34,591	44,502	
	2,350	1,301	895	746	1,064	1,594	859	599	666	935	
	..	2,226	1,414	1,150	1,051	1,080	1,127	1,720	1,038	992	1,408	1,088	
	4,576	2,715	2,045	1,797	2,144	2,821	2,579	1,637	2,074	2,623	
	3,251	
	
SCOTLAND	5,151	6,326	5,922	5,050	3,957	3,831	4,739	5,543	4,781	4,439	4,711	4,240	
	..	8,283	8,263	9,064	9,063	6,047	6,414	1,836	1,971	1,677	1,299	576	597
	..	5,965	4,850	4,879	5,410	3,545	3,854	418	242	359	447	141	174
	..	4,557	4,553	3,232	3,690	3,887	4,141	1,382	1,221	902	1,057	1,048	1,954
	..	838	908	804	787	839	739	570	591	355	418	498	526
	24,794	24,900	23,901	24,600	18,275	18,979	8,945	9,598	8,134	7,660	7,574
	7,491	
NORTHERN IRELAND	9,923	8,736	7,122	7,282	6,759	7,347	2,762	2,565	2,077	2,451	2,138
	97,365	93,282	88,322	79,312	63,308	65,422	47,061	40,837	36,552	46,776	56,837
TOTAL UNITED KINGDOM		2,466

* Details of the monthly figures from September, 1934, to February, 1935, are given on pages 144 and 145 of this *Journal* for May, 1935; from March, 1935, to May, 1935, on page 467 of this *Journal* for August, 1935; from June to August, 1935, on page 799 of this *Journal* for November, 1935; and from September, 1935, to February, 1936, on pages 148 and 149 of this *Journal* for May, 1936.

CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS, 1934-36

TABLE IV (continued).—NUMBER OF CATTLE CERTIFIED FOR PAYMENT UNDER THE CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS AT LIVE-WEIGHT CERTIFICATION CENTRES IN EACH MONTH FROM MARCH TO AUGUST, 1936.

Agricultural Divisions	Cow-Heifers							Total							
	Mar.	Apr.	May	June	July	Aug.	Mar.	Apr.	May	June	July	Aug.			
ENGLAND (excluding Monmouth)	131 .. North-East South-East East Midland West Midland South-West North North-West	103 216 154 282 417 357 926 755 1,453	91 187 152 274 413 926 894 918 1,432	109 229 162 535 428 1,043 847 1,043 1,368	95 169 119 570 328 1,019 791 928 1,368	110 26,440 152 417 570 11,259 8,663 19,690 11,252	7,732 20,015 3,554 8,873 7,451 9,367 8,096 19,658 9,550	8,349 21,773 3,477 6,686 9,547 8,547 7,569 19,558 8,369	8,610 17,620 3,810 9,177 14,790 8,547 7,944 19,612 9,434	8,784 11,494 3,739 14,790 7,783 8,019 9,422 19,592 10,526	7,969 11,494 3,739 14,790 7,783 8,019 10,312 21,329 12,454	6,554 10,280 9,954 15,534 8,019 10,312 19,592 21,329 12,454			
WALES (including Monmouth)	126 283 Total	66 208 ..	62 179	97 172	86 180	90 167	3,335 4,229	1,966 2,660	1,453 2,321	1,509 2,631	2,085 2,948	2,963 3,396			
SCOTLAND	67 28 16 238 24 24	82 40 18 236 281 17	82 34 9 236 281 20	119 17 5 285 306 14	157 17 5 23 23 22	95 28 6,399 6,777 6,015 1,432	11,957 10,147 5,110 6,015 5,116	10,785 10,775 5,247 4,430 1,179	9,608 10,988 5,691 5,028 1,219	8,825 6,640 5,688 5,841 1,360	8,166 7,039 6,033 6,386 1,287				
NORTHERN IRELAND Total	373	398	381	451	508	435	34,112	34,866	32,416	32,711	26,357	26,905			
TOTAL UNITED KINGDOM	5,756	5,218	5,115	5,830	5,725	5,315	150,182	159,337	129,989	131,918	125,871	131,729			

The Agricultural Divisions comprise the Counties of:—

ENGLAND—

Bedford, Huntingdon, Cambridge, Suffolk, Essex, Hertford, Middlesex and London, Norfolk, Lincoln and York, East Riding, Kent, Sussex, Berkshire and Hampshire, Nottingham, Rutland, Northampton, Buckingham, Oxford and Warwick, Worcester, Gloucester, Wilts and Hereford.

Wales—

Anglesey, Caernarvon, Merioneth, Montgomery, Denbigh and Flint, Cardigan, Radnor, Brecon, Monmouth, Glamorgan, Carmarthenshire, Pembrokeshire.

Scotland—

North-East: Nairn, Moray, Banff, Aberdeen and Kincardine. East Central: Angus, Perth, Fife, Clackmannan and Kinross. South-East: West Lothian, Midlothian, East Lothian, Berwick, Roxburgh, Selkirk and Peebles.

West and
South-West:

Ayr, Bute, Dumfriesshire, Stirling, Lanark, Renfrew, Ayr, Dunbartonshire, Kincardinebright and Wigtonshire, Kirkcudbright and Wigtownshire, Zetland, Orkney, Caithness, Sutherland, Ross and Cromarty, and Inverness.

CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS, 1934-36

corresponding six months of 1935. Details of average prices per cwt., dressed-carcass weight, are as follows:—

			1936	1935
			s. d.	s. d.
March	61 4
April	61 2
May	62 11
<hr/>			<hr/>	<hr/>
Three months—March to				
May	59 1
<hr/>			<hr/>	<hr/>
June	62 3
July	63 9
August	62 0
<hr/>			<hr/>	<hr/>
Three months—June to				
August	62 8
<hr/>			<hr/>	<hr/>
Six months—March to				
August	60 9
<hr/>			<hr/>	<hr/>

MARKETING NOTES

Milk Marketing Scheme. Pool prices and rates of producer-retailers' contributions for September, 1936, are given below, with comparative figures for August, 1936, and September, 1935. The wholesale liquid milk price in September, 1936, was 1s. 3d. per gal., 2d. per gal. more than in August, 1936, and 1d. per gal. less than in September, 1935.

Region	Pool Prices			Producer-Retailers' Contributions		
	Sept. 1936	Aug. 1936	Sept. 1935	Sept. 1936	Aug. 1936	Sept. 1935
	d.	d.	d.	d.	d.	d.
Northern ..	11½	9½	12½	3½	3	2½
North-Western ..	11½	9½	12½	3½	3	2½
Eastern ..	12	10	13	2½	2½	2½
East Midland ..	11½	9½	13	2½	2½	2½
West Midland ..	11½	9½	12½	3½	3	3½
North Wales ..	11½	9½	12½	3½	3	3½
South Wales ..	11½	9½	12½	2½	3	2½
Southern ..	12	10	13	2½	2½	2½
Mid-Western ..	11½	9½	12½	3½	3	3½
Far-Western ..	11½	9½	12½	3½	3	3½
South-Eastern ..	12½	10½	13½	2½	2½	2½
Unweighted Average ..	11·64	9·70	12·73	2·96	2·85	2·89

These prices do not include any premiums for special services and level deliveries, or the accredited producers' premium of 1d. per gal.

The number of accredited producers was 18,392 and the sum required for the payment of the accredited premium was equivalent to a levy of 0·347d. per gal.

The inter-regional compensation levy was fixed at 1½d. per gal. on liquid milk sales, the same as in September, 1935.

Sales on wholesale contracts were as follows:—

	Sept., 1936 (estimated)			Sept., 1935	
	Gal.	Gal.	Gal.	Gal.	Gal.
Liquid	46,799,737	46,008,741
Manufacturing	26,853,818	20,050,912
				<hr/>	<hr/>
				73,653,555	66,059,653

Percentage liquid sales ..	..	63·5	69·6
Percentage manufacturing sales ..	..	36·5	30·4

The average realization price of manufacturing milk during September this year was 5·656d. per gal., compared with 5·540d. per gal. for September, 1935. The quantity of milk manufactured into cheese on farms was 2,148,191 gal. compared with 2,519,131 gal. in August and 1,559,854 gal. in September, 1935.

MARKETING NOTES

Milk Products Marketing Scheme. Twenty-eight objections and one representation with respect to this draft Scheme were received by September 30, the closing date for the receipt of objections. In accordance with the requirements of the Agricultural Marketing Act, 1931, the Minister of Agriculture and Fisheries and the Secretary of State for Scotland have directed a public inquiry to be held into the objections. The inquiry will be conducted by Mr. P. E. Sandlands, K.C., and will be opened in London on November 30, 1936, and adjourned to Edinburgh, where the proceedings will commence on December 10, 1936.

Pigs and Bacon Marketing Schemes: *Pig Price for October, 1936.* The basic pig price (Class I, Grade C.) for October, 1936, was 12s. per score compared with 11s. 11d. for September. The cost of feeding-stuffs ration was 8s. 5½d. per cwt. compared with 8s. 1d. in September, and the ascertained price of bacon was 97s. 7d. per cwt. compared with 95s. 7d. in September. The realization value of offals declined from 8s. 6d. to 8s. 5d. per pig.

Bacon Development Board. The Bacon Development Board have announced their intention to add new conditions, to operate from January 1, 1937, to licences held by bacon curers. The new conditions relate mainly to the general hygiene of bacon factories and cover such matters as drainage, cleanliness and repair of premises and equipment, ventilation, lighting, and facilities for ensuring cleanliness of workers.

Potato Marketing Scheme: Riddle Regulations. New riddle regulations were prescribed by the Potato Marketing Board on October 1, 1936, to operate throughout Great Britain, on and from that date, and until further notice, viz., a minimum riddle of 1½ in. for the varieties King Edward, Red King and Golden Wonder, and a minimum riddle of 1⅓ in. for other varieties.

Board's Report for 1935-36. The third annual report of the Board contains an interesting account of the operation of the scheme during the year ended on August 31, 1936.

The number of producers registered under the scheme in England and Wales was 51,067 and in Scotland 13,400, a total of 64,467. The county with most producers was the Holland Division of Lincolnshire with 4,323; the lowest was Radnor, with 11. The county with the highest average potato acreage was East Lothian with 23·2 acres per registered

MARKETING NOTES

producer; the lowest was Merioneth, with 0·6 of an acre per producer. About half of the registered producers had basic acreages of less than 5 acres.

A full account is given of the operation of the riddle regulations, supplemented by diagrams showing the courses of prices in 1935-36 in relation to those of other seasons. It is stated that, compared with 1930-31, the last season of comparable production before the commencement of the scheme, producers of maincrop-white varieties secured in 1935-36 an increased return of £2 10s. per acre.

The organization of authorized merchants under "Market Plan" Committees was developed during the year. The Market Plan policy was adopted "to prevent the undercutting of prices in transactions with retailers, which in the past, almost invariably had an adverse repercussion on the prices offered by merchants to producers." Plans were in operation in most districts during the season, the principal exceptions being London and certain districts in Lancashire and Yorkshire. The report records the appointment of an Industrial Assistant to conduct investigations into the possible uses of potatoes for industrial purposes. It includes, also, an account of the arrangements made for the manufacture of dried potatoes for cattle foods.

The Board have continued their vigorous publicity policy. Cookery demonstrations were staged at a number of exhibitions, and posters, pamphlets and recipe books have been widely distributed.

Sugar-Beet Marketing Scheme: Public Inquiry. A Public Inquiry was held on October 8 and 9 by Mr. F. J. Wrottesley, K.C., the Commissioner appointed by the Minister of Agriculture and Fisheries and the Secretary of State for Scotland, into objections with respect to the proposed Sugar-Beet Marketing Scheme.

The Cattle Fund. Payments under the Cattle Industry (Emergency Provisions) Acts, 1934 to 1936, to producers of certain classes of fat cattle in Great Britain and Northern Ireland amounted, by October 16, to £8,003,019. These payments were in respect of 3,383,647 animals, the average payment per beast being £2 7s. 4d. Some 1,046,497 imported animals have been marked at ports (excluding Northern Ireland) since August 6, 1934, under the marking of Imported Cattle Orders, 1934 and 1935.

MARKETING NOTES

Milk Acts, 1934 and 1936 : Manufacturing Milk. Advances made by the Ministry up to October 15, 1936, in respect of manufacturing milk were as follows:—

Section		Period of Manufacture	Gallons	Amount
	(a) <i>Milk Marketing Board for England and Wales.</i>			£
1	In respect of milk : Manufactured at factories other than the Board's	April, 1934, to July, 1936	457,701,577	2,135,187
2	Manufactured by the Board ..	April, 1934, to Sept., 1935	2,573,662	12,850
3	Made into cheese on farms ..	April, 1934, to June, 1936	36,055,516	187,463
	* Total for England and Wales ..		496,330,755	2,335,500
	(b) <i>Government of Northern Ireland.</i>			
6	In respect of milk : Manufactured into cream and butter at registered creameries ..	April, 1934, to July, 1936	53,800,499	343,487
		TOTAL ..	550,131,254	2,678,987

* Owing to the Cheese-Milk Prices for August and September, 1936, being in excess of the Standard Price, no subsidy is payable in respect of milk produced and manufactured in these months.

Milk-in-Schools Scheme. Exchequer contributions up to October 15, 1936, towards the expenses of the Milk Marketing Board for England and Wales in respect of the supply of 41,664,242 gal. of milk to school-children at reduced rates during the months October, 1934, to July, 1936, amounted to £772,147. From October, 1935, to July, 1936, 18,814,075 gal. of milk were consumed as compared with 20,416,530 gal. in the corresponding months of the first year of the Scheme. Further returns will slightly increase the figures for the second year.

Cheese-Milk Price. For the purpose of payments under the Milk Acts, 1934 and 1936 (whether by the Exchequer to Milk Marketing Boards, or by Boards to the Exchequer) in respect of milk used for manufacture, the cheese-milk price has been certified by the Minister and the Secretary of State for Scotland, to be 5·99 pence per lb. for the month of October, 1936.

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Wheat Act, 1932 : Sales of Home-grown Wheat, Cereal Year, 1936-37. Certificates lodged with the Wheat Commission by registered growers during the period August 1 to October 2, 1936, cover sales of 2,318,343 cwt. of millable wheat as compared with 5,979,258 cwt. in the corresponding period (to October 4) in the last cereal year.

Sugar-Beet : 1936-1937 Campaign. The manufacturing season opened at two factories in the last week of September, and nine factories were in operation in the first week of October. Though the development of the crop was retarded by climatic conditions during a large part of the growing period, preliminary returns of field sampling data indicate that, as a result of improved weather conditions during harvesting, the yield of beet per acre and the sugar content, will be about equal to the average of previous years.

Sugar Industry (Payment of Assistance) Rules, 1936. In accordance with the provisions of the Sugar Industry (Reorganization) Act, 1936, the Minister of Agriculture and Fisheries, with the consent of the Treasury, has made the above-mentioned rules governing the payment of assistance in respect of sugar manufactured in Great Britain from home-grown beet. The rules have been issued as Statutory Rules and Orders, 1936, No. 1082, and copies may be obtained from H.M. Stationery Office, price 2d., post free 2½d.

National Mark Wheat Flour Scheme : Bakers' and Confectioners' Exhibition, 1936. In the British Wheat Flour Competition held at this Exhibition, the class for all English (Yeoman) Wheat Flour milled to National Mark standards, attracted 11 entries from authorized miller-packers in the National Mark Scheme. The gold, silver and bronze medals and diplomas offered by the Ministry to the winning entrants were awarded by the judges as under:—

Gold Medal and Diploma.—Goodacre & Everard, Ltd., Lower Mills, Loughborough, Leics.

Silver Medal and Diploma.—Joseph Smith & Co., Ltd., Roller Flour Mills, March, Cambs.

Bronze Medal and Diploma.—James Nutter, Station Mill, Fulbourn, Cambs.

The gold medal offered by the Ministry to the farmer supplying the largest proportion of wheat used in the winning flour, was gained by Mr. J. Tudhope, Five Oaks Dairy Farm, Stamford-on-Soar, Loughborough.

The National Farmers' Union offered prizes in Class 60 for the best 1 lb. All English Milk loaf (tin) made from

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National Mark flour. Entries by 11 firms were submitted, and the 1st, 2nd and 3rd prizes were respectively awarded to :—

W. Newman, High Street, Brill, Bucks.

Messrs. W. D. Baldwin & Son, 58, Thoroughfare, Woodbridge, Suffolk.

F. J. Griffiths, Victoria Bakery, Cwmbran, Mon.

National Mark Beef. During the three months ended September 30, 1936, the number of sides (including quarters and pieces expressed in terms of sides) of beef graded and marked with the National Mark were as follows. The corresponding figures for the same quarter of 1935 are given for comparative purposes.

	<i>Home Killed</i>			
	<i>Select</i>	<i>Prime</i>	<i>Good</i>	<i>Total</i>
July, Aug. and Sept., 1936	..	19,264	40,606	1,352 61,222
July, Aug. and Sept., 1935	..	21,596	42,324	1,564 65,484

	<i>Scotch Killed</i>			
	<i>Select</i>	<i>Prime</i>	<i>Total</i>	
July, Aug. and Sept., 1936	..	19,806	3,028	22,834
July, Aug. and Sept., 1935	..	16,560	5,397	21,957

The falling-off in the number of sides graded and marked at English centres, is due to an increase in the slaughtering of Canadian cattle at Birkenhead and London.

Grading and Marking of Turkeys, Christmas, 1936. For the fourth year in succession, special arrangements are being made by the Ministry for the grading and marking with the National Mark of home-produced turkeys for the Christmas trade.

All authorized packers in the National Mark Dressed Poultry Scheme are being invited to undertake, on a service charge basis :—

- (a) to collect, kill, grade, mark, pack, and consign home-produced turkeys, or (b) to grade and mark turkeys on producers' premises at agreed rates, which will vary in accordance with the number of birds submitted for grading.

The scheme also provides for the temporary authorization, during the month of December, of producer-dealers, dealers and other producers having an output of not less than 500 turkeys, to apply the National Mark, subject to the usual conditions as to inspection. Producers who cannot reach this figure, or who do not desire to obtain authorization to mark and grade their own turkeys, may either have their turkeys graded on the farm or may send them to a grading centre authorized for the purpose.

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Producer-dealers, dealers or other producers who desire to participate in this scheme, either by becoming temporarily authorized as packers or by having their turkeys graded on the farm or at authorized grading centres, are invited to apply without delay to the Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1, for full particulars of the scheme.

Progress of the National Mark Apple Scheme. The National Mark Scheme for Apples, which came into operation in 1928, was the first grading scheme introduced under the Agricultural Produce (Grading and Marking) Act, passed in that year. The standards of quality and the methods of grading and packing prescribed were from the beginning recognized by the most progressive growers as ideals to be aimed at, and as affording a basis for the reorganization of the marketing of home-grown apples. The Scheme made steady progress. In 1934-35, a season of abundant crops of sound fruit, the quantity of National Mark apples appearing on the markets was such as to establish beyond doubt the advantage of the Scheme to the apple-growing industry of this country. The 1934-35 season also showed such improvements in the technique of apple production and marketing that it was necessary to consider raising the quality standards laid down in the Scheme. This was done, and the Scheme was revised on the basis of stricter statutory definition of the grades. The new grading came into operation in the 1935-36 season when, however, adverse weather conditions resulted in a very short crop, and only a comparatively small bulk of apples was sold under National Mark labels.

The large quantities of apples appearing under the National Mark in the present season are an indication of continued progress. The influence of the Scheme is to be seen in the increased market supplies of apples packed in standard non-returnable containers. Standardized packs of English apples are now a regular feature of the London fruit auctions which have hitherto been reserved for standardized supplies from abroad.

A new feature on the fruit markets this season, is the produce of the Associated Fruit Growers of Essex, Ltd., a group of Essex fruit growers who are using a common label for their produce, and are giving wide publicity to it. The formation of this Association has had a stimulating effect in

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the county, an additional area of about 780 acres having been brought under the Scheme in Essex alone, during the present season.

The total area brought under the Scheme in 1936 throughout the country is, approximately, 1,800 acres.

National Mark Schemes for Fresh Vegetables : *Cabbage Lettuce*. The National Mark Vegetables Trade Committee has recommended, in connexion with its consideration of the National Mark Cabbage Lettuce Scheme, that a sub-committee of that committee be formed, for the purpose of classifying lettuce varieties and their synonyms, and of recommending the varieties that are suitable for packing under the National Mark.

The sub-committee is being set up and will be assisted by the Ministry's Horticulture Commissioner and by members of the seed trade.

National Mark Schemes for Cheese. Particulars of cheese packed under the National Mark during the period July 1 to September 30, 1936, are as follows:—

Type of cheese	Number of packers whose cheese was graded	No. and weight of cheese graded	
		No.	Weight
Cheshire :			cwt.
Farm made	199	41,548	20,000
Creamery made	17	29,524	11,122
Caerphilly	14	107,906	—
Cheddar	10	2,780	1,431
Lancashire	16	14,307	4,921
Wensleydale	5	2,658	185
Leicester*	3	272	76
Stilton :			
Blue	1	1,949	204
White	9	4,564	693
Cream	1	8,789	13

* Grading operations commenced July 28, 1936.

National Mark Creamery Butter Scheme. During the first eleven months of operation of this scheme ending December 31, 1935, 13,644 cwt. of creamery butter was packed under the National Mark. During the first nine months of 1936, the National Mark output was 27,427 cwt. There are 16 authorized packers in the scheme, of whom 14

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are manufacturers, and nearly 4,000,000 labels and wrappers bearing the National Mark have already been used. In view of the satisfactory progress made, the Minister has formally appointed a trade advisory committee, representative of the interests engaged in the production and distribution of home-produced butter, to advise the National Mark Committee and the Minister in regard to the application of the National Mark to creamery butter, and on the general administration of the scheme and the investigational problems involved in the standardization of butter.

The constitution of the National Mark Creamery butter Trade Committee is as follows: Professor H. D. Kay, O.B.E., Ph.D., D.Sc. (Chairman); Messrs. L. Classey, W. J. Cordy, W. B. V. H. P. Gates, M.B.E., D. R. Greig, W. Herman Kent, M.B.E., F.I.S.A., M. L. Oats, F. W. Parsons, T. R. Stanford, O. Thomas, A. Todd, J. H. Wain, and W. W. Waite, M.B.E.

Marketing Demonstrations. Arrangements have been made for demonstrations to be given at the following fat stock shows during November and December.

<i>Show</i>	<i>Location</i>	<i>Date</i>
		1936
Norfolk Fat Stock Show ..	Norwich ..	November 19-21
Birmingham	Birmingham ..	December 2-4
Smithfield	Agricultural Hall, Islington	December 7-11
Liverpool and District Livestock Society	Liverpool ..	December 8 and 9

At the last three shows, above named, the Ministry will stage demonstrations of the operation of the scheme for the direct sale of fat stock from farm to wholesale butcher on a grade and dead-weight basis. Live animals will be exhibited in order to illustrate the types of animals that will kill out at the various carcass grades under the scheme.

A working demonstration of the testing, grading and packing of eggs to National Mark standards will be staged at the Grand International Show, Crystal Palace, London, from November 17-19.

PORtUGAL : Regulation of Bread Supplies.—Three new decrees have been issued recently in Portugal revising the regulations in regard to the trade in bread grains and to bakeries. In consequence of the short 1936 wheat crop, the new supplies will go into consumption immediately, and it is proposed to fix prices in accordance with the new situation. New provisions are also laid down in regard to the milling industry.

In a note accompanying one of the new decrees, it is emphasized that

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the organization of agricultural credit is a problem that remains to be solved. It is possible at present to obtain short term loans from either the Agricultural Co-operative Banks or the "Caixa Nacional do Credito," but recently the latter has interested itself in the question of medium and long term loans and the Government sees in this development the basis for an improvement of the agricultural situation. The organization of such a credit system will only be possible, however, by an extension and improvement of the State organization, and the new decrees will form the basis for the creation of a Portuguese "Food Estate."

The first of the new decrees sets out the prices at which the 1936 wheat crop is to be taken over. Maximum prices are fixed for first and second quality flour, and the prices are graduated according to districts. The production of three types of bread is allowed for Lisbon, but elsewhere only a fine flour type of loaf may be baked. In some districts, however, where it has been the custom to bake bread made of coarse flour, this may be continued. The manufacture of maize and rye bread is only permitted in reliable bakeries, and the same applies to mixtures of flour from different bread grains. The opening of new bakeries will only be allowed under special conditions.

The second decree creates a National Bread Institute. The Institute will be responsible, not only for directing and controlling the manufacture of bread, but will also concern itself with the grading of home-grown wheat according to quality, with technical assistance in the development and improvement of wheat growing, storage, and processing, the examination of home-produced flours and their grading in classes and marks, rules for millers and bakers, including provisions in regard to working hours and the maintenance of milling and baking schools. The funds of the Institute are provided by a State grant included in the annual budget of the Ministry of Agriculture, and by contributions from the general income of the State economic organizations and from the special funds for exhibitions of experimental products, etc.

The third decree creates Guilds of Bakers in Lisbon and Oporto. All persons and corporations concerned in the manufacture of bread in these two places must belong to these guilds. The object of the guilds is to regulate the production of, and trade in, bread, to guard against unfair competition, and to study the interests of the consumer. They must keep statistical records, supervise the carrying out of the legal provisions, and develop technical improvements in baking. Their aims also include the task of improving the conditions of the workers by concluding collective working agreements with the workers' unions, and rendering assistance in trade union and insurance matters. (*Note by the Market Supply Committee.*)

NOVEMBER ON THE FARM

E. J. ROBERTS, M.A., M.Sc.

IN normal seasons the middle of November is about the dividing line between the past season's activities and the settling down to winter operations. Potatoes and mangolds ought to be stored safe from frost, autumn sowing of wheat or other grain crops should have been mostly completed, and the great majority of working horses and cattle will be settling down in their winter quarters. In the western districts of North Wales, November 12 marks the end of the farm year under most leases and agreements, and, in many ways, it is such a suitable date for the end of a tenancy that it is surprising that it should appear to be the custom only in a restricted area. Though seldom referred to by name, the date—November 13—for the beginning of the tenancy is presumably Old Hallowmas, just as May 13 is celebrated as Old May Day, and April 6 as Old Lady Day.

Though there are no pauses in work on the farm, there is generally the feeling, towards the close of this month, that the end of a period of intense activity has been reached. The owner of a large mechanized farm remarked the other day that he welcomed the shortening days because they came to protect men and tractors! From the commencement of the corn harvest to the end of October, both men and tractors had worked long hours, and experience had taught him the wisdom of giving his men a few days' holiday, and his tractors an overhaul. Where tractors are not used, there is not the same feeling of concentrated effort followed by relaxation; the horse cannot continue working long hours, and, except for a few weeks in the year, its daily work does not call for abnormal effort.

After the middle of the month, most cultivations are designed to prepare land for the following spring rather than for immediate sowing. In particular, the ploughing of stubbles in preparation for next year's root crops engages first attention. In spite of all the research conducted on soils, the scientist can give little guidance to the practical man on methods of obtaining the desired tilth at a given time. Even on such a matter as depth of ploughing for a particular field, few would be so bold as to doubt the judgment of the farmer.

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In general, there is a feeling that autumn ploughing should be deep, and arranged so that the soil may drain freely and have a large surface exposed to frost, but nothing more definite can usually be advised. It is very difficult to obtain definite and clear results from experiments on cultivation, largely because no two seasons are alike and fields vary almost as much, even when they are on the same soil type. Still, it might be expected that by now the effect of deepening cultivation from 8 to 10, or even 12 inches, over a few rotations, might in some instances have been measured.

Similarly, as far as the writer is aware, little information exists regarding the effect of subsoiling. It is perhaps too soon to expect information regarding the value of an operation so recently introduced as Gyrotilling. One farmer was recently heard to say that he liked to see the Gyrotiller on his farm because it was one of the few machines he knew that would do what was claimed for it. Another declared that, whether the process was any good or not, to him it was worth the cost to have the satisfaction of seeing his wretched clay land that had caused him so much trouble all his life, being ripped up and so drastically dealt with in quite an off-hand way! Such reasons may pass in a few instances, but survival of the system depends on the securing of definitely paying results.

November brings in a slackening of the cross-country movements of livestock. Cattle have been bought for the yards, hogs for fattening, and ewe flocks made up to strength. A period of activity begins in the livestock departments, and the dairy herd is usually brought in some time this month, though bad weather or special circumstances may have caused it to be housed in October.

Farm Haulage. At this time of the year, when there is so much carting of roots, it is appropriate to consider the advantages offered by the use of pneumatic equipment for farm carts, waggons and lorries. The increasing popularity of these aids to haulage is evident to observers who have travelled in the country in the past few months. Where pneumatic equipment has been tried, it has quickly led to a repeat order, not only because of the easier hauling, but also because vehicles so fitted are very popular with the carters. On a farm in the north, where one such vehicle was bought for trial, there was continual competition among the men

NOVEMBER ON THE FARM

for this cart, and the difficulty had to be solved by buying another.

Farm transport stood in great need of improvement. With the slow pace of the heavy horse, it is evident that loads should be as large as possible, especially when dealing with materials such as roots or farmyard manure, that contain a high percentage of water and consequently have a low value per ton. With pneumatic equipment, consisting of steel wheels with roller bearings and agricultural tyres, greater speed and heavier loads are possible. The modern agricultural tyre is of a special pattern designed to offer the minimum rolling resistance, and the shoulders are buttressed to provide protection from damage from sharp stones, etc.

A recent bulletin by Mr. Alex Hay (Pneumatic Equipment for Horse-drawn Vehicles, Bulletin No. 2, Rubber Growers' Association) contains interesting information on this subject, besides being illustrated by a number of excellent photographs. In trials carried out by the Institute for Research in Agricultural Engineering, University of Oxford (Agricultural Machinery Testing Committee's Report, No. 46, 1934*), the use of this type of equipment resulted in reductions in draught varying from 13 to 41 per cent. The increase in pay load due to the use of these varied from 35 to 108 per cent., according to ground conditions. It is sometimes suggested that a considerable proportion of the improvement is due to the roller bearings that replace the usual type of bearing; Mr. Hay, from the results of tests carried out, considers that this is not so.

Apart from advantages in regard to draught, pneumatic tyres do not sink to the same extent in arable land, and are not so damaging to grass land as the usual iron tyre; where much carting has to be done on grass land, such as where there are cow bails or large poultry units, pneumatic-tyred wheels are almost invariably used. It may, however, be doubted whether the full benefit of the new type of wheel has been yet obtained. The reduction in the size of the wheel, as compared with the standard wooden type, should be exploited by a lowering of the whole vehicle to economize labour in loading, and advantage should be taken of the lighter draught to provide accommodation for a much larger load. Too often the new wheels are placed under a cart

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, Price 3*d.*, post free 3*½d.*

NOVEMBER ON THE FARM

body of conventional design and size, often specially raised in such a way as to nullify the advantages of the wheels. Perhaps the opinion may be hazarded that a long, wide platform with shallow, removable sides will in time be adopted as the most economical in first cost and in everyday operation.

Root Competitions. These competitions, organized by various societies and by seed firms, take place at this period of the year, and, for the next few weeks, the agricultural Press will be recording the prodigious yields attained by the competitors. In judging, yield of crop, spacing, and the appearance of the roots may be taken into account; in some instances, the method of calculating the yield per acre may be open to criticism and lead to yield figures that may be almost described as astronomical, but, this does not detract much from their utility. Beet competitions, which are judged on cultivation, yield, and sugar content, are on a more exact basis, since figures for the two latter are obtained from the factory, and there is less glamour about the judging!

Competitions of this type are useful in focussing attention and raising discussions on the various aspects of successful crop husbandry. Thus, the statement of this year's winner for the best oat crop in the Gloucestershire Root, Fruit and Grain Competition, that he attributes his success mostly to the fact that his land is deficient in lime, cannot but raise many an interesting discussion. Again, these competitions could enable much useful information to be accumulated, such as on the question of spacing in roots. Contests of this type are much encouraged in New Zealand; in the *New Zealand Journal of Agriculture*, Vol. 51, No. 6, it is stated that, in four districts only, a total of 912 farmers entered for the various crop competitions in 1935.

Sheep Feed. Rape, kale, turnips and beet-tops are plentiful this year; this was partly responsible for the high price of store sheep in the autumn. Rape, which may be grown alone, or mixed with turnips, is not suitable for keeping far into the winter, being easily damaged by frost. The damage is not caused so much by the direct action of frost on the leaves, as by the slender leaf stalks getting frozen and snapping off in the wind. Turnips and kale are used as long as possible, having the advantage over swedes of being soft.

NOVEMBER ON THE FARM

Marrow-stem kale, an increasingly popular succulent, is better before the end of January than after, since the lower leaves are lost and the stems get very fibrous and woody if the crop is kept too long. An experiment at Boghall, Edinburgh, indicated that marrow-stem kale is not the equal of swedes for fattening sheep; in one trial, 75 per cent. of the sheep in the swede group were ready for slaughter at a given date, while, on the same date, only 25 per cent. of the kale group were sufficiently fat.

Beet-tops may be as nutritious as swedes if free from adhering soil. Experiments at Cambridge and at the Norfolk Experimental Farm indicate the high value of clean beet-tops, and the importance of attempting to handle and cart off the crop in such a way as to effect the minimum of contamination with soil. Beet-tops should be allowed to lie on the ground for about 10 days before they are used.

There are many qualities of hay this year on most farms, but shepherds generally succeed in getting the best, especially after the ewes have lambed. Though they do not appear to be particularly observant when the hay is gathered in, shepherds seem to have an uncanny knowledge of the distribution of the best lots of hay in the barn! There is probably strong reason for giving the shepherd a free hand in the matter of hay. Folded sheep have to submit to drastic changes of food in regard to succulents, and there is no doubt that, with racks full of good hay, the sheep consume less succulents, and suffer less at the change-over. So great is the variation in the quality of hay, that some lots may have twice the feeding value of others. It is difficult to judge the value accurately by the usual methods, and a recent suggestion by Mr. James Mackintosh, of Reading, that farmers should have analyses made in order to enable them to grade their hay, is deserving of wide attention. In the Wye provincial area, there has been in operation for some time a scheme for the purpose of estimating the starch equivalent of the hay from the protein and fibre contents.

NOTES ON MANURING

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Field Experiments. The interpretation of the results of manurial experiments requires considerable caution. Each year sees the publication of the results of further trials, but it is not always easy to view this new evidence in the right perspective, for, sometimes, the very fact that it is new tends to make it assume an unjustifiable importance, whilst, in other cases, old ideas are so firmly established as to be well-nigh unassailable. A further danger lies in the consideration of tables of yield data with little or no reference to the field conditions under which the trial was conducted. Separated in this way from their descriptive context, yield data may be highly misleading. When artificial fertilizers are used on land previously farmed with little or no manurial treatment, their beneficial effects on crop growth are usually only too obvious from an inspection of the growing crop. In the course of time, however, regular applications of fertilizer tend to raise the level of fertility, and further dressings applied in any particular season may sometimes fail to produce a visible effect on the crop then growing. Unfortunately, the naked eye cannot always judge small yield differences with sufficient certainty to say that a fertilizer application, costing only a few shillings per acre, has or has not produced a profitable increase in crop. Properly replicated field trials, however, will usually give reliable information about much smaller differences than those that can be detected by mere inspection of the growing crop.

A large amount of land in this country is still below the fertility level at which response to fertilizers can only be detected by very elaborate experiments. The large number of farmers who use little or no artificial fertilizer has been the subject of comment by previous contributors of these notes. Anyone who is in close touch with a large area of land, such as an Advisory Province, or a County, is usually aware of land that, through lack of fertilizer treatment in the past, will give a very striking response to an application of fertilizer supplying one or other of the common elements of

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plant food. A fertilizer experiment on such a soil, however, only serves to indicate the needs of neighbouring land similarly neglected in the past, and possibly, also, to demonstrate the way in which the various plant foods affect the crop. To farmers who are familiar with the circumstances, especially those who are farming land in similar low "condition," such experiments afford valuable guidance. To the regular user of fertilizers, however, there are definite dangers from these highly spectacular results, unless it is made clear that they must be interpreted in the light of the low state of fertility of the experimental field. Not only may he lose faith in the value of fertilizers when he fails to obtain an equally spectacular result on his own farm, but he may also be led to use fertilizer dressings entirely unsuitable or uneconomic for his own conditions. In a similar way there is an even greater danger of the non-user of fertilizers being supported in his neglect when faced with the results of trials on land in "good heart," showing only small responses in any one season, unless such results are accompanied by an adequate and convincing description of the original high level of fertility of that land. It is usually far easier to lead the regular user of fertilizers to think that he is not using enough than it is to persuade the unbeliever to use any at all.

Again, so much depends on climatic conditions that the decision as to whether or not any particular fertilizer treatment is likely to prove a sound investment should only be taken in the light of experience extending over a number of seasons, embracing a variety of weather conditions. The effect also of the fertilizer on the following crop or crops in the rotation must not be overlooked. From this standpoint, it is obviously desirable that many manurial experiments, especially those dealing with materials which, if not taken up by the crop, may remain in the soil in a state available to succeeding crops, should as far as possible be continued through the rotation of crops, so that the treatment can be considered from the standpoint of its effect on the rotation as a whole rather than on one individual crop. The fact that, in some districts, crop rotations are no longer adhered to so strictly as in the past is not a serious obstacle to this type of experiment. Many farmers still try to keep to some basic cropping plan for most of their land, and any departure from the rotation is often no more than the replacement of one crop

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by some crop with very similar manurial requirements. Unfortunately, the number of experiments in which it has been possible to follow such residual effects has been relatively small, and, in the past, the farmer has had to rely to a large extent on the results of one-year experiments to guide him in his choice of fertilizers for arable crops. In addition to the obvious disadvantages of such incomplete evidence, these one-year trials have automatically led many farmers to think largely in terms of the immediate requirements of individual crops rather than to plan a standard manuring policy on the lines suggested by Rayns in these notes for October, 1934. To determine the manuring of a field entirely from the standpoint of the next crop to be grown thereon, represents a hand-to-mouth existence that can rarely give the best results. In many years, a large part of the fertilizers applied to any particular crop may not become available in time to be fully utilized by that crop owing to the influence of such factors as drought. In a succession of seasons characterized by generally unfavourable conditions, land farmed on a regular system of manuring designed to maintain the fertility of the soil at a uniformly satisfactory level gives consistently better results than similar land on which an attempt is made to supply direct to the individual crops just what they are expected to be able to utilize in each season. Crops that can draw on a steady reserve of plant food are in a much better position to resist adverse conditions than those which have to depend solely on the immediate availability of fertilizer applications.

Modern developments in the technique of field experimentation have made it possible to determine with reasonable accuracy whether or not even a small yield difference is really due to a particular fertilizer treatment or merely some chance variation from plot to plot, such as the small soil irregularities found on most fields. We are still left, however, with only very cumbersome and rather inadequate methods of defining the actual "condition" or fertility level at which the response was obtained. In time, chemical analysis may make it possible to indicate with greater precision the level of soil fertility at which some particular response to fertilizer treatment may be expected, and thereby enable experimental results to be applied with some confidence to a whole area of land of similar analysis. Before this becomes practicable, however, chemical analysis will have to be more closely

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related to actual response to fertilizers in the field, and field experiments must, in turn, be linked up with the various soil types.

At the present time, once a farmer is convinced of the value of proper manurial treatment, and has adopted a policy based on the general principles of manuring, as determined at such centres as Rothamsted and Woburn, he should look for further guidance to the results of experiments carried out in his immediate neighbourhood on land in similar "condition" to his own. General recommendations as to correct fertilizer treatment for any particular crop should be regarded as only a rough guide, to be modified to suit the "condition" and manuring policy of his own farm.

Soil Conditions in Tomato Houses. A strong, healthy root-system at all stages in the growth of the crop is essential if a good yield of tomatoes is to be obtained. The results of many years' work at the Cheshunt Research Station have served to emphasize that, no matter how liberally the crop is manured, the soil itself must be in good *physical* condition if a satisfactory root-system is to be developed. To ensure satisfactory conditions in the soil and sub-soil throughout the growing season, careful attention must be paid to the winter work in the glasshouse. In addition to the actual digging operations, the need for liming, the application of dung, the incorporation of straw or other coarse organic material, and winter flooding, must all be considered.

The once universal practice of liming for tomatoes has been the subject of considerable criticism in recent years. Good crops of tomatoes have been grown on slightly acid soils, but under such conditions other troubles may arise. On the whole, it is advisable to use sufficient lime to prevent the soil becoming acid, though there appear to be adequate grounds for the suggestion that the heavy dressings used in the past can be substantially reduced. Lime will help to maintain heavy soils in good physical condition, making them more open and thereby facilitating root development, but an annual dressing equivalent to 10 to 20 cwt. per acre of burnt lime, should usually be ample. To be effective, lime must be thoroughly incorporated in the soil, and the best way to do this is to apply the lime in a finely-ground state when the soil is fairly dry, and, if possible, work it into the soil before watering. As regards the use of dung, bacterial action, aeration and soil conditions generally are all improved by the

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application of short, well-rotted horse dung. Such material also supplies plant nutrients, especially nitrogen.

The incorporation of straw in glasshouse soils during the winter digging is sometimes advocated as a means of avoiding, or, at any rate, postponing for a time, the costly operation of soil sterilization. The heavy crops grown on new land that has been in grass for some years are undoubtedly associated with the beneficial effects of the fibrous grass roots and other organic matter. These, by assisting drainage and aeration of the soil, make conditions suitable for extensive root development. The gradual diminution in the yield of tomatoes from a house erected on new land can be overcome to a large extent by the sterilization of the soil, either by steam or chemicals. Experimental work, however, has shown that the trouble is also often associated with loss of physical condition, especially the disappearance of coarse organic material from the soil. Of various methods of maintaining the amount of this coarse organic matter in the soil, the most promising appears to be the addition of straw or peat. Suitable peat material is expensive, but the cost of wheat-straw is not too high for the practice to be an economic success under suitable conditions. The straw is placed almost vertically in the soil, not spread on the surface and dug in, the quantity used being 3 tons per acre each to the top and second spit. Subsequently the straw must be thoroughly wetted. The results of experiments on these lines published to date, suggest that the use of straw in this way is not always desirable, e.g., on light, sandy soil. Decomposition of the straw is brought about at the expense of soil nitrates, and, as sometimes recorded in experiments on green-manuring and the ploughing-in of straw for ordinary agricultural crops, it may temporarily deplete the soil of its available nitrogen to such an extent that, for a time, the crop suffers from nitrogen deficiency. In the Report of Experiments carried out by the Cheshunt Research Station in 1935, further reference is made to this aspect of the problem, and it is stated that whilst, generally speaking, the results of using straw have been excellent on heavy land previously well manured, they vary on average soils, and the treatment is *not* advised on poor, light soils.

Sub-soil dryness is another condition that may interfere with the growth of the tomato crop. This cannot be easily remedied during the actual growing season, and the best treat-

NOTES ON MANURING

ment is winter flooding, usually during December and early January. Flooding, both as regards time and quantity, should be regulated according to the conditions in the house to be treated, especially type of soil and drainage conditions —heavy soils can easily be injured by the use of excessive quantities of water late in the winter.

Careful attention to the need or otherwise for each of these winter operations is essential if a satisfactory root-system, capable of taking up the necessary moisture and plant foods, is to be developed and maintained throughout the growing season. The choice of manures, though worthy of serious consideration, is of secondary importance to the preparation of the soil.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton (2,240 lb.) during week ended Oct. 14th.				
	Bristol	Hull	L'pool	London	Cost per Unit £
Nitrate of Soda (N. 15½%) ..	£ 7 12d	£ 7 12d	£ 7 12d	£ 7 12d	9 10
" " Granulated (N. 16%) ..	7 12d	7 12d	7 12d	7 12d	9 6
Nitrate of Lime (N. 13%) ..	7 od	7 od	7 od	7 od	10 9
Nitro-Chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of Ammonia:					
Neutral (N. 20·6%)	6 17d	6 17d	6 17d	6 17d	6 8
Calcium Cyanamide (N. 20·6%) ..	6 17e	6 17e	6 17e	6 17e	6 8
Kainite (Pot. 14%)	2 18	2 15	2 15	2 15	3 11
Potash Salts (Pot. 30%) ..	5 0	4 17	4 15	4 17	3 3
(Pot. 20%) ..	3 15	3 12	3 12	3 12	3 7
Muriate of Potash (Pot. 50%) ..	8 3	8 1	7 17	8 1	3 3
Sulphate .. (Pot. 48%) ..	9 15	9 13	9 9	9 13	4 0
Basic Slag (P.A. 15½%) ..	2 10c	2 0c	..	2 0c	2 11
(P.A. 14%)	2 6c	1 16c	1 16c	2 3c	3 1
Grd. Rock Phosphate (P.A. 26— 27½%)	2 10d	2 5a	2 10a	2 5a	1 8
Superphosphate (S.P.A. 16%) ..	2 19	..	2 19f	2 19g	3 6
(S.P.A. 13½%) ..	2 15	2 13	2 15f	2 12g	3 10
Bone Meal (N. 3½% P.A. 20½%) ..	..	6 10	6 5h	6 5	..
Steamed Bone Flour (N. 4% P.A. 27½—29½%)	5 12	5 10	5 0h	4 15	..

Abbreviations . . .

N = Nitrogen ;

P.A. = Phosphoric Acid ;

S.P.A. = Soluble Phosphoric Acid ;

Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage-paid prices

§ Prices are for not less than 2-ton lots, nett cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. prices.

a Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London, f.o.r. depots in London districts. Fineness 80% through standard sieve.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 3s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 3s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra, for lots of 10 cwt. and under 1 ton 15s. extra, and for lots of less than 10 cwt. but not less than 2 cwt. 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails; southern rails 1s. 3d. extra.

h Prices shown are f.o.r. Appley Bridge.

¶ These are calculated by regarding a ton as comprising 100 "units" (equal parts of 22·4 lb.) so that a manure, for example, with 16 per cent. nitrogen, contains 16 such "units" in a ton. Then if the price per ton of such a fertilizer be divided by the percentage figure, the deducted cost is that of a "unit" of that agent. Those in the table above are based on London prices. (For further explanation, see Advisory Leaflet No. 146, "The Valuation of Artificial Manures," obtainable from the Ministry, free of charge.)

NOTES ON FEEDING

CHARLES CROWTHER, M.A., PH.D.,
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Grass and Hay for Winter Feeding. The summer of 1936 will be recorded in the history of most farms as a bad hay year. Some good hay has been won, far more is of only moderate quality, while much is definitely bad. Even on the select few farms that are now equipped with artificial driers, much of the produce probably falls far short of the standards of "concentration" and nutritive value that earlier experience in better seasons had shown to be attainable. Costs of production have certainly been relatively high, and may well serve as a conservative basis for future estimates of the economy of grass-drying.

These facts must needs be taken into account in planning the feeding programme in cattle rearing, cattle feeding and milk production for the coming winter, and for this purpose it is necessary to understand just what contribution good grass or hay can make to the nutrition of the animal, and how this contribution is likely to be affected when the produce has been subjected to adverse conditions.

It must be understood at the very outset that grass, even under perfect conditions, and whether consumed fresh or in the preserved form, is bound to vary considerably in composition and nutritive properties. It consists of the leaves and stems of living plants, and, therefore, whilst on the plant, must be changing in character from day to day, so that all statements as to its quantitative nature can only have a general or average application, from which individual samples may diverge widely.

By far the greater part of the dry substance (and therefore of the nutrient) of grass consists of carbohydrates of varying degrees of digestibility, ranging from easily digestible sugars to the carbohydrates that constitute the "fibre" of the hay and are digested with difficulty. Apart from its direct contribution to the nutritive value of the hay, this "fibre" acts usefully also in producing the relatively high degree of bulkiness that is desirable in the food of the ruminant.

What we usually value most, however, in grass (and greenstuff generally), is the contribution it makes in proteins, minerals and vitamins. Doubtless, good grass contributes, to

NOTES ON FEEDING

the ration also, other factors of which, as yet, we have little or no knowledge. From the chemical point of view, grass is good if it is relatively rich in proteins, minerals and vitamins, and poor in fibre.

The content of proteins is largely determined by the stage of growth at which the grass is taken, but it is also influenced by other factors, such as soil, season and manuring, which may also affect the amount and nature of the minerals taken up by the grass. Whether these factors also affect the content of vitamins cannot yet be stated with certainty, but this content is certainly subject to variation.

Protein Content. The dry matter of grass in the first 3-4 weeks of growth will often contain 20-25 per cent. of protein, whereas that of grass cut at the more advanced stage usual for haymaking will rarely contain more than 10-12 per cent. Even under the most perfect conditions of preservation, therefore, such as are approached in careful artificial drying, one batch of dried grass cut at a very early stage of growth may contain 2-2½ times as much protein as another batch cut at a much later stage. That such variations are actually being found in drying practice on the farm is already evident in published records of the experience on different farms.

This wide possibility of protein variation must constitute a serious difficulty to any close scientific control of feeding, if dried grass is used to any considerable extent to replace the concentrated foods commonly used in production rations. With the latter class of food, no serious error is incurred in using average figures for protein content, but, clearly, any such assumption for dried grass might prove to be very inaccurate. Where production is closely allied to protein supply, as in the feeding of milch cows, the farmer who proposes to use his dried grass extensively as a "concentrate" will, therefore, be well advised to have frequent recourse to chemical analysis of his product during the drying season, and, if a wide variation is found, to grade it according to protein content—say into three classes, 20 per cent. and over, 15-20 per cent. and under 15 per cent.

Similar considerations arise also in connexion with the feeding of hay, and here the uncertainties due to the natural variations of the grass and the effect of soil and season thereupon are accentuated by the variable losses of protein during the haymaking process. In this case, since recourse to chemical analysis is hardly practicable, it will be well to

NOTES ON FEEDING

assume that the great bulk of the 1936 hay crop will be well below the average in protein content—and, indeed, in most other respects, with the exception of fibre, which will be well above the average both in amount and indigestibility.

Mineral Content. The dry matter of grass grown under average conditions will usually contain about 8 or 9 per cent. of minerals, and this proportion does not change much with advancing growth until after the flowering stage. It may be appreciably affected both in amount and nature, however, by the mineral status of the soil, rainfall, and manuring. If the grass be left to seed before being cut, some part of the more valuable, soluble minerals may pass back to the soil, especially in wet weather, and this loss is naturally greatly accentuated after cutting if the hay is much exposed to rain. Good hay from land well supplied with the essential minerals is an almost infallible safeguard against mineral deficiencies if it is used in fair quantities; even this year's moderate hay will probably cover the needs of moderate production so far as lime and phosphoric acid are concerned, but may not be adequate with regard to the more soluble minerals, such as potash and salt. For high production of milk it will probably need a "complete" mineral supplement.

Vitamin Content. Grass probably contains all the known types of vitamins, but the amount present may vary considerably according to conditions that cannot yet be defined. Most attention has hitherto been paid by research workers to the content of vitamins A and D, the former being associated with the carotene ingredient of the grass-colouring matters, and the latter produced directly by the exposure to the ultra-violet radiations from the sun. Both are more abundant in summer grass than in autumn or winter growth. The concentration tends to vary from year to year, but the real causes of this variation are still obscure. With the types of drying plant now in use, the loss of vitamin during drying is apparently not very great, nor does much further loss take place during storage of the dried product. Different consignments of dried grass may, however, show considerable variations.

When the cut grass is made into silage, appreciable losses of vitamins may occur, but probably less than in making hay under good conditions. When made into hay under bad conditions, practically all the vitamin A of the grass is lost—a point that must not be overlooked, therefore, during the

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coming winter. Vitamin D is more resistant to "weathering" influences, and poor hay is, therefore, not necessarily much inferior to good hay in this respect.

Fibre Content. The proportion and nature of the "fibre" present in grass varies at different stages of growth, being lowest and most digestible in the early stages; highest and least digestible in the mature plant. The dry matter of young grass commonly contains 15-20 per cent. of fibre of about 80 per cent. digestibility; that of well-won hay 25-30 per cent. fibre of about 60 per cent. digestibility. The contribution of the fibre to the total digestible matter of the grass is thus about the same in each case, but, at the hay stage, the fibre is harder and tougher, and consequently requires more energy for mastication and digestion, and its contribution to the effective productive energy of the grass is correspondingly less. Considering young grass in which the dry matter contains 20 per cent. of fibre, one would credit it with a production value equal to 6-8 per cent. of starch, whereas in a hay in which the dry matter contains 30 per cent. of fibre, one could hardly credit the fibre with any production value. In a very poor hay containing more than 30 per cent. of fibre in the dry matter, the nutritive effect of the other ingredients of the hay would almost certainly be reduced thereby, and its value could not be rated higher than that of straw. The economy of feeding hay of this low quality is doubtful, since, apart from its own low value, it will almost certainly be unpalatable and apt to lead to digestive disturbance and reduced effectiveness of the whole diet. Used as litter, it would add fully twice as much to the manure as if passed through the animal, and, on farms where manure can be effectively used, this would probably be the more effective use to make of it.

Marrow Stem Kale. The merits of this crop are now widely acknowledged, but all too frequently because it takes the place of roots in the cropping, it is regarded as a substitute for roots also in the feeding programme, whereas it is more strictly comparable with grass and hay. This is well brought out in the analyses made recently at Cambridge, in which also thousand-headed kale was included.

Taking the whole plant, marrow stem kale was found to contain about 13-14 per cent. of dry matter throughout the autumn and winter, the proportion thus being singularly constant and rather below that of young spring grass.

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Rather more than one-half of the dry matter was contained in the leaves, a little over one-third in the rinds, and the balance of 10 per cent. in the marrow. The marrow was more watery than the rest of the plant and its dry matter was rich in sugars.

The average proportion of crude protein in the dry matter was 15-17 per cent., including 12-13 per cent. of true protein; thus being closely similar in this respect to young grass of average quality. The similarity extended also to the fibre content, which was very constant in all samples at 18-19 per cent. of the dry matter.

In digestion trials with sheep, excellent results were obtained, fully equal to those previously found with other greenstuffs. On the basis of these data, the dry matter of marrow stem kale represents a feeding-stuff of about 65 per cent. starch equivalent, including about 9½ per cent. of digestible "protein equivalent."

Another interesting point that comes out of the Cambridge data is the relative richness of the kales in mineral matters, especially lime, chlorine, potash and sulphur.

The leaf is the part richest in lime and sulphur, whilst the dry matter of the marrow is richer in phosphorus, potash, soda and magnesia. Clearly, the farmer who has a kale crop can make good use of it for remedying the defects of his hay supply.

Feeding of Diseased Potatoes. Another problem of the coming winter on many farms will be the disposal of potatoes affected with disease. These can be fed to live stock, but, if more than slightly affected, or if fed in large quantities, they should first be well boiled or steamed. It is advisable to throw away the water in which the cooking has taken place as this may contain deleterious ingredients, especially if the potatoes are badly affected. Storage of cooked potatoes is practicable if they are packed tightly in a pit silo and well trodden down. Potatoes so ensiled have been found to give as good results in pig-feeding as ordinary steamed potatoes, about 4½ lb. being equivalent in general feeding value to 1 lb. of cereal meal.

In using potatoes liberally in pig-feeding, their poverty in protein and minerals must be kept in mind, and allowed for in making up the meal supplement. Care must also be taken to avoid so raising the quantity of potatoes fed that the optimum amount of supplementary meal is not consumed. In

PRICES OF FEEDING STUFFS

the case of baconers, such excess would also probably lead to poor grading of the carcasses. Roughly speaking, the pig should take about one-third to one-quarter of a full allowance of meal and satisfy the rest of his appetite with potatoes given at two feeds daily. A common practice on the Continent is to give the pig a fixed daily allowance of about 1 lb. of a meal mixture containing 20-30 per cent. of protein concentrate, and leave the animal to satisfy its appetite on potatoes.

PRICES OF FEEDING STUFFS

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
Wheat, British ..	£ 8 7	£ 0 8	£ 7 19	72	2 2	1·16	9·6
Barley, British feeding ..	6 7 8	0 8	5 19	71	1 8	0·89	6·2
,, Danubian ..	6 18	0 8	0 10	71	1 10	0·98	6·2
,, Persian ..	6 5 8	0 8	5 17	71	1 8	0·89	6·2
Oats, English, white ..	6 17	0 9	6 8	60	2 2	1·16	7·6
,, black & grey ..	6 17	0 9	6 8	60	2 2	1·16	7·6
,, Scotch, white ..	8 7	0 9	7 18	60	2 8	1·43	7·6
,, Canadian, No. 2 ..							
Western ..	8 10*	0 9	8 1	60	2 8	1·43	7·6
,, Canadian, mixed feed ..	6 18	0 9	6 9	60	2 2	1·16	7·6
,, Canadian, feed No. 1 ..	7 8†	0 9	6 19	60	2 4	1·25	7·6
Maize, Argentine ..	6 2	0 7	5 15	78	1 6	0·80	7·6
,, Danubian Gal. Fox ..	6 3†	0 7	5 16	78	1 6	0·80	7·6
Peas, Japanese ..	18 12†	0 14	17 18	69	5 2	2·77	18·1
Milling Offals :—							
Bran, British ..	6 7	0 15	5 12	43	2 7	1·38	9·9
broad ..	7 0	0 15	6 5	43	2 11	1·56	10
Middlings, fine, imported ..	6 17	0 12	6 5	69	1 10	0·98	12·1
Weatings‡ ..	7 2	0 13	6 9	56	2 4	1·25	10·7
Superfine‡ ..	7 15	0 12	7 3	69	2 1	1·12	12·1
Pollards, imported ..	6 10	0 13	5 17	50	2 4	1·25	11
Meal, barley ..	8 5	0 8	7 17	71	2 3	1·20	6·2
,, grade II ..	7 10	0 8	7 2	71	2 0	1·07	6·2
,, maize ..	6 12	0 7	6 5	78	1 7	0·85	7·6
,, locust bean ..	7 15	0 5	7 10	71	2 1	1·12	3·6
,, bean ..	8 5	0 16	7 9	66	2 3	1·20	19·7
,, fish ..	14 10	2 1	12 9	59	4 3	2·28	53
Maize, cooked, flaked ..	7 2	0 7	6 15	84	1 7	0·85	9·2
,, gluten feed ..	6 5	0 12	5 13	76	1 6	0·80	19·2
Linseed cake—							
English, 12% oil ..	9 10	0 19	8 11	74	2 4	1·25	24·6
,, 9% ..	9 0	0 19	8 1	74	2 2	1·16	24·6
,, 8% ..	8 15	0 19	7 16	74	2 1	1·12	24·6

PRICES OF FEEDING STUFFS (*continued*)

Description	Price per ton	Manuri- al value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
Soya-bean cake, 5½% oil	£ 9 15s	£ 1 s.	£ 8 8	69	s. d. 2 5	d. 1·29	% 36·9
Cottonseed cake, English, Egyptian seed, 4½% oil ..	5 10	0 17	4 13	42	2 3	1·20	17·3
Cottonseed cake, Egyptian 4½% oil ..	5 7	0 17	4 10	42	2 2	1·16	17·3
Cottonseed cake, decorticated, 7% oil ..	7 17†	1 7	6 10	68	1 11	1·03	34·7
Cottonseed meal, decorticated, 7% oil ..	7 17†	1 7	6 10	70	1 10	0·98	36·8
Coconut cake, 6% oil ..	6 15	0 17	5 18	77	1 6	0·80	16·4
Ground nut cake, decorticated, 6–7% oil	7 17†	1 6	6 11	73	1 10	0·98	41·3
Ground - nut cake, imported decorti- cated, 6–7% oil ..	8 2	1 6	6 16	73	1 10	0·98	41·3
Palm-kernel cake, 4½–5½% oil ..	6 15†	0 11	6 4	73	1 8	0·89	16·9
Palm-kernel cake meal, 4½% oil	6 12†	0 11	6 1	73	1 8	0·89	16·9
Palm-kernel meal, 1–2% oil	6 2	0 11	5 11	71	1 7	0·85	16·5
Feeding treacle ..	5 0	0 8	4 12	51	1 10	0·98	2·7
Brewers' grains, dried ale	5 15	0 10	5 5	48	2 2	1·16	12·5
Brewers' grains, dried porter	5 7	0 10	4 17	48	2 0	1·07	12·5

* At Bristol. § At Hull. † At Liverpool.

‡ In these instances manurial value, starch equivalent and protein equivalent are provisional.

NOTE : The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex-mill or store. The prices were current at the end of September, 1936, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then, since its manurial value is 19s. per ton as shown above, the cost of food value per ton is £9 1s. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 5d. Dividing this again by 22·4, the number of pounds of starch equivalent in one unit, the cost per lb. of starch equivalent is 1·29d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices :— N., 6s. 10d.; P₂O₅, 2s. 3d.; K₂O, 3s. 4d.

FARM VALUES OF FEEDING STUFFS

The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows :—

		Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported) ..	..	71	6·2	6 11
Maize ..	..	78	7·6	6 2
Decorticated ground-nut cake ..		73	41·3	7 19
" cottonseed cake ..		68	34·7	7 17

(Add 10s. per ton, in each instance, for carriage.)

The cost per unit starch equivalent works out at 1·72 shillings, and per unit protein equivalent, 1·23 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

In accordance with the recommendation of this Committee the " food values " given in the following table may be taken as applicable to the ensuing four months, December to March, inclusive, for the purposes of advisory schemes in the rationing of dairy cows.

FARM VALUES.

Crops.		Starch equivalent	Food value per ton, on farm	£ s.
		Per cent.	Per cent.	
Roots—				
Kohl Rabi ..	..	8	0·5	0 14
Mangolds ..	..	7	0·4	0 13
Potatoes ..	..	18	0·8	1 12
Swedes ..	..	7	0·7	0 13
Turnips ..	..	4	0·4	0 7
Green Foods—				
Cabbage, drumhead ..	..	7	0·9	0 13
" open-leaved ..		9	1·5	0 17
Kale, marrow stem ..	..	9	1·3	0 17
Silage, vetch and oats ..		13	1·6	1 4
Hay—				
Clover hay ..	..	38	7·0	3 14
Lucerne hay ..		29	7·9	3 0
Meadow hay, poor ..	..	22	2·9	2 1
" good ..		37	4·6	3 9
" very good ..		48	7·8	4 12
Seeds hay ..	..	29	4·9	2 16
Straws—				
Barley straw ..	..	23	0·7	2 0
Bean straw ..	..	23	1·7	2 2
Oat straw ..	..	20	0·9	1 16
Wheat straw ..	..	13	0·1	1 2
Grains and seeds—				
Barley ..	..	71	0·2	6 10
Beans ..	..	66	19·7	6 18
Oats ..	..	60	7·6	5 13
Peas ..	..	69	18·1	7 1
Wheat ..	..	72	9·6	6 16

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d., post free 7d.

MISCELLANEOUS NOTES

Stud Goat Scheme

THIS Scheme, having for its object the improvement of the productive quality of milch goats kept by smallholders, cottagers and others of similar position, is being continued for the season 1936-37. For the current breeding season, which lasts till February 28 next, 101 stud goats have been registered and are standing at various centres throughout the country, including 11 in Wales, and their services are available for goats belonging to persons in the above-mentioned categories at a nominal fee, in no case exceeding 4s. Conditions of service and other information may be obtained from the County Agricultural Organizers at their respective County Education Offices, or from the Secretary of the British Goat Society, Roydon Road, Diss, Norfolk, which is responsible for the administration of the Scheme.

The report on the operation of the scheme during the season 1935-36 has now been issued. The Ministry's grant available for premiums was increased from £270 to £320, and thirty-seven counties were represented as compared with thirty-four in the previous season, Cardiganshire, Caernarvonshire, Devon, Flintshire, Merioneth and Westmorland re-entering the list. The number of goats accepted for registration increased from 76 to 92, classified as follows: British 23, British Saanen 20, Saanen 18, British Toggenburg 9, British Alpine 8, Anglo-Nubian 8 and Toggenburg 6. All the Saanens were descendants of those imported in 1922. The Secretary of the British Goat Society reports a growing interest in the Scheme on the part of cottagers and others who appreciate the improvement in their milking stock that is being effected by its means.

The Agricultural Index Number

THE September index of prices of agricultural produce at 127 (base 1911-13=100) is 8 points higher than that recorded for August and 6 points above the corresponding figure of a year ago. (If allowance be made for payments under the Wheat Act, 1932, and the Cattle Industry (Emergency Provisions) Act, 1934, the revised index number becomes 133.) The rise in the general index is attributable very largely to higher prices of milk, potatoes and barley,

MISCELLANEOUS NOTES

and, to a lesser extent, fat sheep and hay. Average prices of wheat, oats and fat cattle were lower than in August.

Monthly index numbers of prices of Agricultural Produce. (Corresponding months of 1911-13 = 100.)

Month	1931	1932	1933	1934	1935	1936
January ..	130	122	107	114	117	119
February ..	126	117	106	112	115	118
March ..	123	113	102	108	112	116
April ..	123	117	105	111	119	123
May ..	122	115	102	112	111	115
June ..	123	111	100	110	111	116
July ..	121	106	101	114	114	117
August ..	121	105	105	119	113	119
September ..	120	104	107	119	121	127
October ..	113	100	107	115	113	—
November ..	112	101	109	114	113	—
December ..	117	103	110	113	114	—

Revised monthly index numbers of prices of Agricultural Produce, allowing for payments under the Wheat Act (a) and the Cattle Industry (Emergency Provisions) Act (b).

Month	1932	1933	1934	1935	1936
January ..	---	111	119	124	125
February ..	—	110	117	122	123
March ..	—	106	112	119	122
April ..	—	109	116	126	129
May ..	—	105	116	117	120
June ..	—	104	114	117	121
July ..	—	104	117	120	121
August ..	108	108	122	120	124
September ..	108	111	125	128	133
October ..	104	112	121	120	—
November ..	105	113	120	119	—
December ..	107	114	120	120	—

(a) Commenced August, 1932. (b) Commenced September, 1934.

Grain. At an average of 7s. 4d. per cwt., wheat showed a reduction on the month of 4d., but, owing to a rather larger fall having occurred during the base period, the index moves from 96 to 98. (If the "deficiency payment" under the Wheat Act, 1932, is taken into consideration, the index is 130.) On account of the usual seasonal increase in the marketing of malting descriptions, barley at 10s. 4d. per cwt. was 2s. 9d. per cwt. more than a month earlier and the index rises by 24 points to 124. Oats at 6s. 7d. per cwt. compares with 6s. 10d. in August, but, with a similar fall in the base

MISCELLANEOUS NOTES

price, the index remains unchanged at 98. A year ago, wheat averaged 4s. 10d. per cwt., barley 10s. 1d. and oats 6s. 1d., the relative indices being 64, 121 and 90.

Live stock. Fat cattle prices continued to decline, and at 32s. 10d. per live cwt. the average for second quality was lower by 1s. 7d., the index moving from 102 to 98. The addition of the subsidy under the Cattle Industry (Emergency Provisions) Act, 1934, brings the index up to 113. At an average of 9½d. per lb. for second quality, fat sheep sold at 4d. per lb. more than in the previous month, and the index rises by 3 points to 131. Baconers were unchanged both in price (11s. 5d. per score of 20 lb.) and index (111), while porkers averaged 11s. 10d. per score and showed a rise of 6d., the index advancing from 107 to 109.

Compared with August, dairy cows were slightly dearer, but, as a similar increase in price occurred during the base period, the index remains at 103. On the other hand, store cattle were cheaper and the index at 97 is lower by 4 points. Quotations for store sheep and pigs showed an increase, the respective indices moving from 126 to 132 and from 133 to 138.

Dairy and Poultry Produce. The increase of 2d. per gal. in the regional contract price of milk in September is reflected by a rise in the index of 27 to 202. Butter averaged 1s. 1½d. per lb. as against 1s. 1d. in August, but as the upward movement was less pronounced than that recorded during the base years, the index declines from 100 to 98. Quotations for eggs rose from 14s. 4d. to 14s. 9d. per 120, but here again the increase was less than during the corresponding months of 1931-33 and the index falls by 6 points to 124; at this level, however, it is still 5 points above a year ago. Cheese was slightly lower in price, and the index falls from 113 to 106. The September prices and indices for poultry were somewhat irregular; the combined index at 112 is, however, reduced by only 1 point.

Other Commodities. The potato index shows a rise of 40 points to 149 and compares with 147 for September, 1935. Average quotations for both descriptions of hay were higher, clover advancing from £4 14s. 6d. to £5 1s. per ton and meadow from £3 7s. to £3 14s. 6d. The combined index for hay at 105 is 7 points above that of the previous month. At 1s. 1d. per lb. wool rose in price by ½d., the index moving upwards from 95 to 100.

MISCELLANEOUS NOTES

Monthly index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity	1934	1936				
	Sept.	Sept.	June	July	Aug.	Sept.
Wheat ..	68	64	84	86	96	98
Barley ..	127	121	92	84	100	124
Oats ..	98	90	82	83	98	98
Fat cattle ..	104	94	98	100	102	98
,, sheep ..	124	114	131	128	128	131
Bacon pigs ..	102	93	119	113	111	111
Pork ..	109	98	112	106	107	109
Eggs ..	103	119	114	123	130	124
Poultry ..	117	117	124	117	113	112
Milk ..	168	215	162	175	175	202
Butter ..	87	89	98	100	100	98
Cheese ..	94	78	108	113	113	106
Potatoes ..	158	147	160	139	109	149
Hay ..	104	95	83	82	98	105
Wool ..	87	89	94	94	95	100
Dairy cows ..	105	105	103	104	103	103
Store cattle ..	88	88	96	101	101	97
,, sheep ..	113	124	119	113	126	132
,, pigs ..	142	122	122	126	133	138

Revised index numbers due to payments under the Wheat Act and the Cattle Industry (Emergency Provisions) Act.

Wheat ..	116	121*	115	112	122	130
Fat Cattle ..	119	100	111	114	117	113
General Index ..	125	128	121	121	124	133

* Superseding figure previously published.

Travelling Scholarship in Agriculture

THE Governors of the College of Estate Management have awarded a Travelling Scholarship in Agriculture to Mr. Claude Culpin, M.A., University Demonstrator in Agricultural Engineering at the School of Agriculture, Cambridge University. Mr. Culpin will be visiting Germany and America to investigate the application of power and machinery to agriculture.

Foot-and-Mouth Disease.—Four outbreaks of Foot-and-Mouth Disease have been confirmed at Upper Heyford, Oxfordshire, the first on October 11 and the last on October 18. The usual restrictions were imposed over an area of approximately 15 miles round the infected premises; and the disease position remaining satisfactory, the area was reduced to approximately five miles radius round the parish of Upper Heyford on October 26.

An outbreak was confirmed at Sealand, near Chester, on October 15.

APPOINTMENTS

and there have since been five other confirmed outbreaks in the same area, on October 17, 18 and 21 (two outbreaks), at Sealand, and, on October 20, at Churston Heath, Chester. Restrictions were imposed over an area of approximately 15 miles radius round Sealand on October 15 and no extensions of the area have been necessitated by the later outbreaks.

There were no further outbreaks in the Sussex Infected Area and the area was finally released from restrictions on September 28.

Enforcement of Minimum Rates of Wages.—During the month ending October 13, 1936, legal proceedings were taken against eight employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

Committee Area	Court	Fines Imposed	Costs Allowed	Arrears of Wages ordered	No. of workers involved
Cheshire ..	Crewe ..	£ 4 0 0	£ 10 0	£ 62 8 0	2
Devon ..	Hatherleigh ..	2 0 0	0 18 0	20 0 0	1
Gloucester ..	Cheltenham ..	12 0 0	0 12 6	44 13 9	2
" ..	Chipping Sodbury ..	10 0 0	0 7 0	5 10 0	1
Kent ..	Tunbridge Wells ..	2 0 0	—	22 10 7	1
Lancs ..	Kirkham ..	9 0 0	0 3 0	15 0 0	3
Monmouth ..	Newport ..	3 0 0	3 0 0	44 0 0	3
Stafford ..	Leek ..	10 0 0	0 6 6	30 0 0	2
		52 0 0	5 17 0	244 2 4	15

APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS: ENGLAND

Berkshire: Miss G. V. Moore, N.D.D., has been appointed Assistant Dairying Instructor, *vice* Miss N. Taylor, N.D.D.

Cambridgeshire: Mr. W. S. Turner has been appointed Manager of the Egg-Laying Trials, *vice* Miss E. Moss.

Devonshire: Miss E. L. Coleman, N.D.D., has been appointed Assistant Dairying Instructor, *vice* Miss M. W. Earle, N.D.D.

Miss M. W. Earle, N.D.D., C.D.D., has been appointed Instructor in Domestic Science (Dairying and Poultry-keeping), *vice* Miss E. M. Bartle, B.Sc., N.D.D.

Dorset: Miss C. E. Day, N.D.P., has been appointed Assistant Manager of the Egg-laying Trials, *vice* Mr. P. Gale.

Durham: Miss M. D. Allan, N.D.P., has been appointed Poultry Instructor, *vice* Mr. H. Wignall, N.D.A., N.D.D.

Miss U. M. Heler, N.D.P., has been appointed Assistant Poultry Instructor, *vice* Miss M. D. Allan, N.D.P.

Essex: Mr. R. Robertson, N.D.A., N.D.D., has been appointed Assistant Lecturer in Agriculture.

Mr. F. C. Creyke, N.D.A., N.D.D., has been appointed Assistant Dairying Instructor, *vice* Mr. R. Robertson, N.D.A., N.D.D.

Mr. W. J. Lintin, N.D.P. (Hons.), has been appointed Assistant Instructor in Poultry-keeping, *vice* Mr. F. H. Jones.

WIRELESS TALKS TO FARMERS, NOVEMBER, 1936

Leicestershire: Miss U. A. Ridgway, N.D.D., B.D.F.D., has been appointed Dairying Instructor, *vice* Miss E. Pratt-Saddington.

Middlesex: Miss L. C. Style, N.D.H., has been appointed Assistant Horticultural Instructor.

Suffolk (East and West): Mrs. E. T. Gregory, N.D.D., has been appointed Assistant Poultry Instructor.

WIRELESS TALKS TO FARMERS, NOVEMBER, 1936

<i>Station and Date</i>	<i>Time : p.m.</i>	<i>Speaker</i>	<i>Subject</i>
National : November 2, 9, 16, 23 and 30	6.20	Mr. Anthony Hurd	For Farmers only.
Midland : November 12 ,, 20	6.40 6.40	Mr. W. B. Thompson Mr. W. B. Thompson and Mr. Anderson, an expert on beef	For Midland Farmers. For Midland Farmers.
West : November 5	6.40	Messrs. A. W. Ling and John Tanner	For Western Farmers : The butcher's point of view.
,, 19 ,, 6	6.40 7.30	Mr. A. W. Ling Mr. Reginald Arkell	For Western Farmers. Countryman Afield : Richard Jefferies and his Friends.
Scottish : November 3	6.20	Messrs. A. D. Buchanan Smith and William Bruce	Pigs and Bacon : a dis- cussion.
,, 6	8.30	*	The Everlasting Heri- tage : The Land in Cultivation.
,, 12 ,, 19	6.50 6.40	Mr. William J. Wright Sir Robert Greig, M.C., LL.D.	For Scottish Farmers. What Research is Doing.
,, 20	8.25	†	The Everlasting Heri- tage : Town into Country.
Welsh : November 13	7.30	Mr. Moses Griffith and Prof. R. H. Thomas	Fruit Trees for Cultiva- tion in Wales.
,, 27	Not fixed	Messrs. Moses Griffith and S. B. Thomas	The Dairy Show in Lon- don.
North : November 6	6.40	Mr. N. C. McPherson	Gardening for Profit : Frames and Lettuces.
,, 13	6.40	Messrs. W. B. Mercer and A. N. Other	Late Potatoes.

* In the Scottish series "The Everlasting Heritage," the subject on November 6, at 8.30 p.m. will be "The Land in Cultivation," and the speakers include Mr. James Walker, of Fife, who is Chairman of a smallholders' association, and, as a contrast, Mr. John Mackie of Bent, Laurencekirk, who farms 700 acres entirely by mechanized methods. Other speakers will be Mr. J. B. Douglas, of Barstibly, Castle Douglas, who is a large dairy farmer, and Mr. James Ewen; while Mr. Joseph Duncan will sum up the different views.

NOTICES OF BOOKS

† On November 20, in "Town into Country," there will be a discussion between the Townsman and Sir Robert Greig, on the chances a townsman has of making a living off the land. Sir Robert will call witnesses, including Miss Katherine Boyd, of the School of Rural Domestic Economy, Craibstone, Aberdeen, a smallholder from at own, and his wife, and a boy from Musselburgh who went to work on Mr. A. D. Buchanan Smith's farm at the age of eighteen.

NOTICES OF BOOKS

Humus: Origin, Chemical Composition and Importance in Nature.

By Professor Selman A. Waksman. Pp. xi+494. (London : Baillière, Tindall and Cox. 1936. Price 30s.)

Practical men have always regarded farmyard manure as the basis of soil fertility and, until a century ago, most agricultural writers treated humus literally as the food of plants. After the error of this view had been shown by the work of de Saussure and Boussingault, and driven home by the satire of Liebig, there was no clear reason for attaching great importance to the part played by organic matter in the economy of the soil. The field experiments, even at well-equipped stations such as Rothamsted, were concerned mainly with the inorganic plant foods, and the critics who maintained that artificial fertilizers alone were not enough, failed to establish the long-term trials needed to settle questions which have long been hotly debated. It is, of course, well known that farming is easier with abundant supplies of farmyard manure, but it is difficult if not impossible to assess the cost of this manure in different systems of farm management. Soil investigators have summarized empirical observations on the effects of humus in such statements as "it improves the physical properties of the soil," "provides a reservoir of slowly available plant foods," "smooths out seasonal irregularities," "provides energy for the micro-organisms," and "generally acts as a buffer in the widest sense of the term." They have established so many possible effects of farmyard manure in special circumstances—including such unexpected ones as the supply of small but essential amounts of copper or zinc—and related so many soil properties to the decomposition of plant residues that they are now, probably, more enthusiastic advocates of the importance of humus than the staunchest opponent of Liebig's mineral theory a century ago. They would, however, generally admit that the vast mass of laboratory work on humus and its decomposition has been of very little service in interpreting their empirical observations. They have abandoned the formulæ and methods of analyses which played so large a part in the textbooks and controversies of a few decades ago and they now treat the whole complex of organic materials in the soil as humus. For many purposes, they are content with determining the organic carbon and nitrogen, though many attempts are also being made to devise means of fractionating humus into such groups of compounds as cellulose, hemicelluloses, modified lignins and proteins. It appears that the essential constituents are complexes formed by the condensation of the lignin residues from plants with proteins from micro-organisms.

The main advances in our knowledge of humus have always come from some new development in one of the pure sciences, such as colloid chemistry and microbiology. At the moment, it appears that the most promising developments are to be expected from the youthful science of pedology. The maintenance of the soil humus must always remain one of the main objectives in permanent systems of agriculture, for most of the disastrous failures through drought, erosion, sand-drift, can be traced to systems of agricultural management which are so unsuited to the climatic conditions in that they interfere with the normal return of plant residues to the soil whilst intensifying the destructive processes.

NOTICES OF BOOKS

A detailed review of the history and present position of work on humus was particularly needed at the present time. No one could have undertaken it more usefully than Professor S. A. Waksman, who has made notable original contributions to the subject, and, in addition, has a unique familiarity with the literature of soil science in English, French, German and Russian. The scale of his monograph is shown by the fact that it includes a bibliography with the full titles and references of well over 1,300 papers. His historical summary is particularly valuable and should clear up much of the confusion which has resulted from the uncritical use of earlier work and methods. The central section on the origin and nature of humus will be useful to students and investigators, even though it emphasizes our ignorance. It should serve to check the unhappy combination of inadequate methods with dogmatic conclusions which has stultified so much effort in the past. The third section on the "Decomposition of Humus, its Functions and Application" is inevitably scrappy, but it suggests ways in which investigations in special fields can be related to the main problem of soil science and, indeed, to our knowledge of the most important source of human wealth. "Humus," says Thaer in a text quoted by Waksman on his title page, "is the product of living matter, and the source of it."

The Scientific Principles of Plant Protection, with Special Reference to Chemical Control. By Hubert Martin, D.Sc., F.I.C. Pp. xii + 379. (London : Edward Arnold & Co., 1936. Price 21s.).

The second edition of this well-known work is very welcome. In order to take account of the advances that have been made in all branches of the subject since the book first appeared, in 1928, the author has found it necessary to re-write completely almost every chapter, increasing the size of the book by some sixty pages, but the general plan remains unchanged. Students of economic entomology and mycology and, indeed, all interested in the protection of crops from pests and diseases, owe a considerable debt of gratitude to Dr. Martin for undertaking the laborious task of bringing his book up-to-date and making available a clear and carefully documented discussion of the very varied aspects of the subject ; and the author's aim, as stated in his preface, to assist co-operation between biologists, chemists, and physicists in this wide field of work, will undoubtedly be amply achieved.

It is not necessary here to attempt to review the contents of the book in any detail. The theme of the main central section (Chapters V-XIII) is the physico-chemical factors and problems involved in the use of insecticides, fungicides and weed-killers. This is a field in which the author has himself made notable contributions, and his account is admirably done. There is also a particularly interesting discussion of recent progress in methods for the determination of toxicity to insects and fungi, and in the difficult study of the relationships between chemical constitution and toxicity ; and other valuable chapters deal with plant resistance, the influence of external factors on the susceptibility of plants to attack by insects and fungi, biological control, methods of trapping insects and the treatment of the centres and vectors of infection.

The first edition of the work has proved its value, not only for the presentation of "principles," but as a reference book ; the second edition more than maintains the standard then set and should add many new readers.

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NOTES FOR THE MONTH

The Imperial Fruit Show, 1936

THE 16th Imperial Fruit Show, held at Liverpool from October 30 to November 7, was as successful as the previous Shows held in the other populous centres of the country. It enjoyed the support of the Lord Mayor and Corporation and the active co-operation of the Liverpool Fruit Traders.

The entries of fruit sent for the competition classes were as numerous as ever—over two thousand packages of apples, pears and oranges from England, Canada, South Africa and Australia; over three thousand cans of fruit from the canneries of this country and other parts of the Empire; three thousand jars of honey; and numerous bottles of cider and pure fruit beverages.

The judges, who work in panels of three, do not pick out the exhibits which look the best, but award marks to every single exhibit. One panel examines and allots marks for the packing: another panel for colour: a third for freedom from blemish; and a fourth for quality and internal condition. The total maximum points are 100, and in this Show it is seldom that any exhibit wins a prize unless it receives 90 points, the best gaining 97 and 98. The marks by each panel are entered on a score card and are printed in the catalogue so that the exhibitors may learn of their weak and strong points. This proves of great educational interest to all exhibitors and to some visitors.

The following are a few of the chief awards:—

Class I.—Ten Boxes Dessert Apples (Open to the British Empire).

First Prize shared { Miss M. B. Amos, Suffolk.

Messrs. W. Seabrook & Sons, Essex.

Class II.—Ten Boxes Culinary Apples (Open to the British Empire).

Mr. W. F. Gaskain, Kent.

The Champion Cup for English Dessert Apples.

Mr. Stuart Macdonald, Essex.

The Champion Cup for English Culinary Apples.

Mr. William Brice, Kent.

Dessert Apples. Many of the prizes for dessert apples were won by growers in the counties of Essex and Suffolk. The

NOTES FOR THE MONTH

winning apples were large, firm and full of juice, with particularly bright scarlets and reds on clear, golden-yellow skins. Evidently, the Essex growers have learnt the proper technique of applying fertilizers to the soil to produce just the fruit with the right texture, clear skins and brightness.

Culinary Apples. Among culinary varieties, the Kent growers were dominant and won many of the first prizes. These Kent apples were large in size, clear of skin and almost free of any pest damage. One or two exhibits of Edward VII were almost perfect in size, texture and colour.

Generally, the colour and quality of all the apples were below normal owing to the wet summer, yet they were much freer from blemishes and pest damages than usual, which seems to suggest that the English growers are becoming more successful with their sprayings.

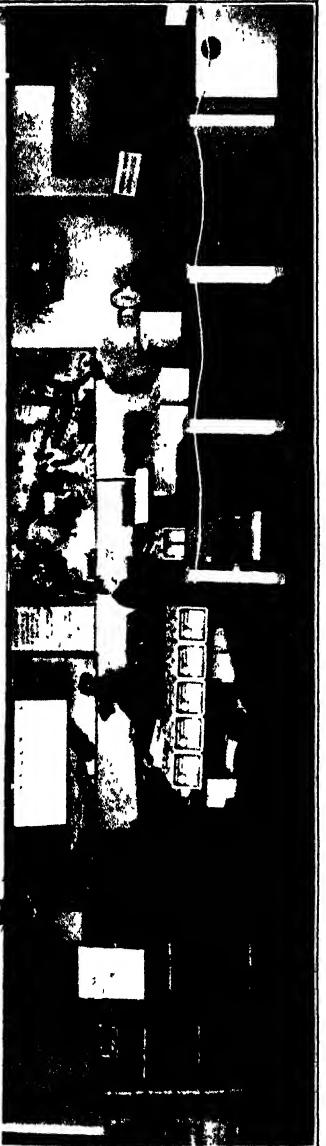
Canned Produce. The interest in the canning section continued, and this section created more interest amongst the Overseas canners than formerly. Australian canners were particularly interested in pears, peaches and apricots: South African canners in Cape Berries and Guavas; while the home growers exhibited many kinds of English fruit and vegetables.

The United Canners, Ltd., Lincs, secured most prizes in the canned produce section and so won the Silver Challenge Cup.

Fruit Beverages. Classes for cider have been included for several years. This year, classes were included for any Pure Fruit Beverages and these were very well supported. Ten firms competed with over fifty different exhibits. These comprised fruit syrups for use in the home, in milk bars and soda fountains: fruit juices and fruit squashes: aerated fruit beverages and fruit wines—all being prepared from pure fruit juice. The judges made fourteen awards of merit, seven of which were secured by Messrs. E. W. Carter & Co., Bristol. The raspberry, loganberry and cherry syrups reached a high standard and the aerated beverages from these were excellent drinks.

Surrounding the competition fruits were the stands proper. The Ministry of Agriculture demonstrated methods of fruit grading and packing to National Mark standards: Great Britain, Northern Ireland, Canada, South Africa, and Malaya had stands making attractive displays of the fruits and fruit products for which each country is famous, whilst there were numerous trade stands at which visitors were received and

FRUIT GRADING & MINISTRY

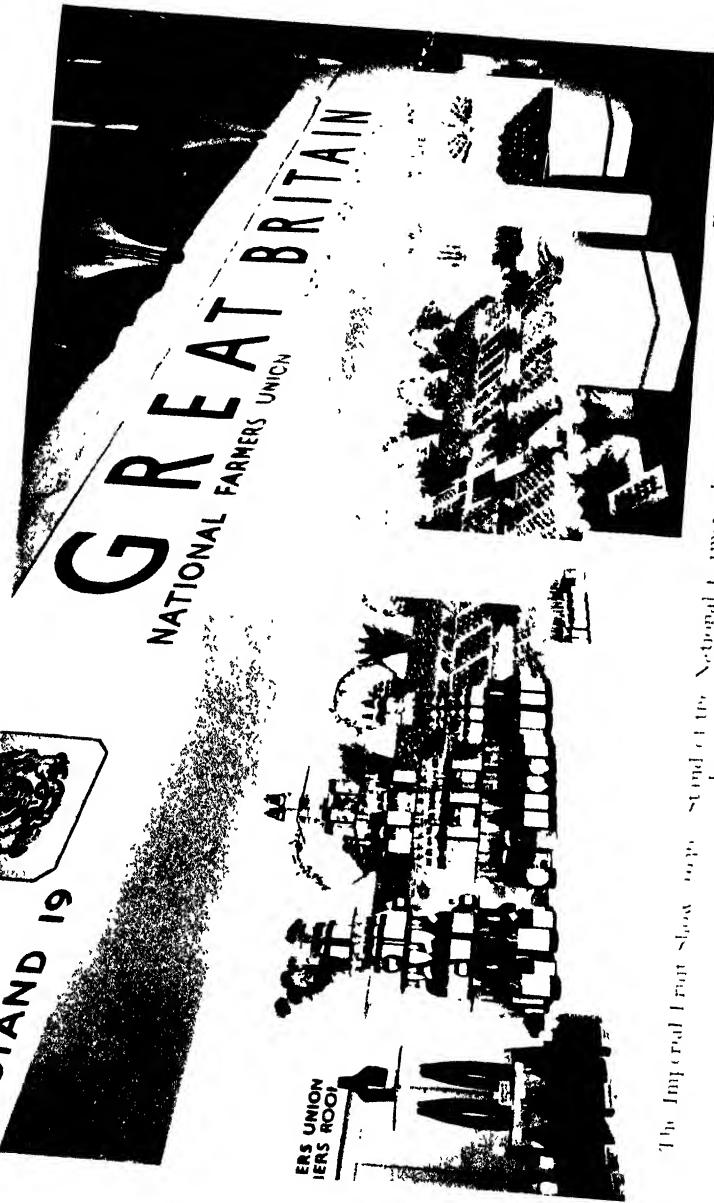


AGRICULTURE & MARKETING EXHIBIT



Photo - S. Sekar Balaji.

STAND 19



The Imperial Farm Show
Stand of the National Farmers Union and the National Federation of
Farmers Institutes from the Farmers Institute Building, Birmingham, England.

NOTES FOR THE MONTH

business conducted. All the fruit experts and the canners gather at the Show to attend meetings and conventions, etc., so that the prevailing topic concerns fruit, its production and preservation.

The Show had much also to interest the public, and people crowded into the alleys and galleries in an almost continuous stream. They examined the wonderful stands of fruit, competed in the many competitions arranged for their amusement, and finally went home laden with a bag of "show fruits" purchased at a special stall at popular prices. The Liverpool people certainly became "fruit conscious" and so the Show fulfilled its object.

Investigations into the Causes of Blackening of Potatoes on Cooking

BLACKENING on cooking has an adverse effect on the marketing and consumption of potatoes, and although some research as to the cause has been undertaken previously, the results have been inconclusive. It is known that some varieties, such as the "King George," are more prone to blacken than others, and potatoes grown on certain soils, especially during wet summers, are liable to blacken on cooking. The cause, however, has still to be discovered.

The subject has engaged the attention of the Ministry and the Potato Marketing Board for some time, and the possibility of research into the question was discussed at a meeting recently held at the Ministry, at which representatives of the Potato Marketing Board and interested research workers were present. It was agreed that further research was desirable, and the Potato Marketing Board has decided to provide funds in order that a comprehensive investigation into the cause and remedy can be undertaken. Chemical and cooking tests will be carried out, and the relation of blackening to the nature of the soil, manuring, variety, source of seed, method of lifting and other factors will be studied. The Potato Marketing Board will arrange for the collection of potato samples on a large scale from all the important potato-growing centres of Great Britain. Cooking tests will be made in Messrs. Lyons' Laboratories, under the direction of Dr. Lampitt, while chemical tests on duplicate samples will be carried out at the Imperial College of Science and Technology under the direction of Professor V. H. Blackman. At this latter centre, the Board has also provided funds for

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the appointment of a bio-chemist to study the fundamental nature of blackening.

The statistical work in connexion with the investigation will be undertaken at Rothamsted Experimental Station, where a Conference, convened by the Ministry, and attended by the Regional Supervisors and representatives of the Executive Committee of the Potato Marketing Board, together with representatives of the Agricultural Research Council and of the centres participating in the work, was held on October 15 to discuss details of the field work and the questionnaire to be sent in with each sample. Mr. V. E. Wilkins of the Ministry presided, and addresses dealing with the problem of blackening, and the scope of the investigation, were given by Sir Daniel Hall, Professor Blackman, Dr. Lampitt, and Mr. Yates of Rothamsted. At the conclusion of the discussion, papers on the experimental work on potatoes that had been carried out at Rothamsted, were read by Dr. E. M. Crowther and Mr. Yates.

Latvian Clover

DURING the past nine years, the Latvian Ministry of Finance has issued a series of publications in various languages, dealing with economic questions concerning the Baltic states and Latvia in particular. The latest volume* contains an account of the reforms introduced by the Latvian Government since May 15, 1934, with special reference to the subject of exports. M. J. Steps, Director-General of the Central Society for the Exportation of Seeds, contributes an article entitled "La Lettonie: Pays des Semences de Qualité Supérieure," in which he recalls the fact that Latvia has long been known as a producing country for clover and timothy seed.

Every year, it is stated, Latvian clover seed is exported in more or less large quantities to various European countries, including Great Britain. During the season 1934-35, approximately 80,000 cwt. of red clover seed was exported, 20,000 cwt. of hybrid clover and 12,000 cwt. of timothy. Latvian clover yields a good hay crop and is luxuriant in growth, qualities that explain the heavy demand for seed from all parts of Europe. In addition, it is noteworthy that the Latvian clover does not contain the least trace of dodder.

* *L'Economiste Letton*, 1936. Edited by J. Bokalderis. Pp. 144.
(Riga : Ministry of Finance.)

NOTES FOR THE MONTH

Two varieties of red clover are cultivated in Latvia, viz., early-flowering and late-flowering, the latter being 10 to 20 per cent. dearer in foreign markets than the former, because it always yields a heavier crop of hay. In order to guarantee seed types, the Latvian Ministry of Agriculture has organized inspection of clover fields by its technical staff. In the recorded fields, the seed is harvested under supervision, cleaned, and to each sack is affixed the seal of the State Seed Control Station. In addition, on each sack is placed a label stating the type of clover within. Since the exportation of seed is entrusted exclusively to the Central Society for the Exportation of Latvian Seed, and is effected under State supervision, invariability of type is absolutely guaranteed.

The alsike clover of Latvia, like the red clover, is persistent and yields good crops. It has proved very hardy in wet conditions. For some years past, experiments with alsike clovers from different countries have been conducted in Finland. These experiments have established beyond all doubt that, with regard to yield and resistance, Latvian alsike clover can compare advantageously with that of Sweden. In Finland, a law has been enacted prohibiting the importation of alsike clover seed from all countries except Sweden and Latvia.

The cultivation of timothy for seed production has made considerable progress during the past four or five years. The best seeds of this plant are produced in Latgalia, and are remarkably hardy and very leafy, which explains the abundant crops of hay that they produce. The actual seeds are much larger than those produced in America or Western Europe. They contain few grains without husk, which determines their clear silvery tint and assures germination up to 90 per cent., in consequence of which their commercial value is much increased.

Industrial Fibres

FOR British farmers, wool is the most immediately interesting of textile fibres, but the incidence of other industrial fibres has an all-important bearing on the employment of wool.

Industrial Fibres, a review just issued by the Imperial Economic Committee,* indicates that most of the chief textile

* *Industrial Fibres*: A Summary of Figures of Production, Trade and Consumption relating to Cotton, Wool, Silk, Flax, Jute, Hemp and Rayon. Obtainable from Imperial Economic Committee, 2, Queen Anne's Gate, London, S.W.1. Price 2s. 6d., post free 2s. 9d.

NOTES FOR THE MONTH

manufacturing countries of the world are conspicuously deficient in raw materials, and that only a comparatively small part of the production of natural fibres is utilized in the country of first production. Such fibres accordingly enter largely into the channels of international trade.

The review summarizes the figures of production, trade and, where possible, consumption of cotton, wool, silk, flax, hemp, jute and rayon during the past eight years, and indicates the more significant changes. In recent years, financial and economic difficulties have somewhat impeded the normal distribution of natural fibres. Further, there has been a marked development of secondary industries in such countries as China, India, Australia and Argentina, and a consequently reduced overseas market for the finished products of the older manufacturing countries. Indeed, the industrial development of Japan has been a factor of major importance in the changing world textile situation. In the period reviewed, Japan has not only retained its place as the world's chief supplier of raw silk, but has also become a large manufacturer of silk fabrics for export. At the same time, Japan has become the largest importer and the second largest consumer of raw cotton, and in eight years has more than doubled its consumption of wool.

An outstanding development during the period under review has been the increased production of rayon. World production in 1928 is estimated at 360 million lb., and, in 1935, at nearly 950 million lb. Rayon has definitely established itself as a textile fibre with marked characteristics and a widening sphere of utilization, illustrated by the recent adaptation of staple fibre for use on cotton and worsted machinery. The United States is the largest producer of rayon. Japan, where the development of the industry has been particularly marked, now takes second place; Italy provides nearly half the estimated production of staple fibre.

Consumption statistics in the chief manufacturing countries do not exist, so that the extent to which rayon has been substituted for other textile fibres remains problematical. On the one hand, the use of rayon in mixed goods has undoubtedly extended the range of textile products and widened the scope of utilization of cotton and wool. On the other hand, it has probably replaced natural fibres in certain branches of the hosiery industry, if not elsewhere. It is significant that three of the largest producers of rayon, Japan,

NOTES FOR THE MONTH

Italy and Germany, are particularly dependent on foreign sources of supply for their textile raw materials.

Bibliography of Literature on Agricultural Meteorology

THE Ministry has recently issued a second mimeographed Bibliography of Literature on Agricultural Meteorology in continuation of a previous work, on a more ambitious scale, which was published in 1932 and is now out of print. It is not claimed that the present bibliography is a complete reference to papers, etc., dealing with agricultural meteorology; it consists of the titles of those papers noted in the Ministry during the ordinary course of the administration of the Agricultural Meteorological Scheme from the perusal of the original periodicals, digests and other sources. The titles so noted between October, 1930, and the end of September, 1933, are included.

The bibliography has been widely circulated, both in this country, in India, and in the Dominions and Colonies. A few copies remain, and are available, gratis, to workers and others interested. Applications should be addressed to the Secretary, Agricultural Meteorological Committee, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1. It is hoped to issue a further bibliography, covering the period October, 1933, to September, 1936, at the end of the present year and thereafter at annual intervals.

Onion Growing in England

WITH reference to the article by Mr. A. H. Hoare, "Onion Growing in England: A New Commercial Method," published in this JOURNAL for July last, p. 333, Mr. David Kemp (Caversham) observes that he has grown onions in different parts of England and Scotland during the last 60 years, and considers that the results of the test mentioned by Mr. Hoare could be improved upon, especially as regards the individual size and weight of onions. Mr. Kemp has tried many varieties, and thinks that Sutton's "Solidity" is the best onion in cultivation for sowing in autumn and transplanting in spring, and the best-keeping variety that he has tried—some of the 1935 crop were in good condition in April, 1936. A strong point in its favour is its non-dolting quality: even the onions left in the autumn-sown bed to ripen did not show more than 4 per cent. of dolters.

The following particulars respecting crops of garden-grown

NOTES FOR THE MONTH

onions, (i) autumn-sown and transplanted in spring, and (ii) spring-sown and thinned, may be of interest. It is held by Mr. Kemp that his method could be applied on the commercial scale. The variety in each instance was Sutton's "Solidity."

(i) *Autumn-sown.* Sown on August 8, 1935, in rows 12 in. apart; the soil was a thin layer of light soil over 6 to 10 ft. of gravel, with chalk below, and received no special treatment.

The soil into which the onions were transplanted received a good dressing of cow and pig manure, dug in during the first week of March, 1936, and the plants were put in the day after digging was completed (transplanting is usually done in February if weather conditions are favourable). The rows were 12 in. apart, and the plants 9 in. apart in some rows and 6 in. apart in others. The plants 9 in. apart made the larger bulbs, the general run being 1 lb. 4 oz. to 1 lb. 8 oz. Those 6 in. apart made smaller bulbs on the average, but gave a greater weight per row. For big bulbs, therefore, a distance of 9 in. is best; for weight of crop, 6 in.

After the first dressing of animal manure no fertilizer of any kind was given, nor was watering done. A small 4-tined fork was used to keep the ground clear and open during the growing period: a fork is preferred to any sort of hoe for this work, as about 1 in. of loose soil can be left as a mulch.

The bulbs were loosened in the soil with a fork the day before lifting; they were allowed to dry a day after being pulled up, and then tied in bundles of 8 to 10 bulbs and taken direct to a dry, airy, wooden shed, where they were hung on nails around the sides of the shed.

(ii) *Spring-sown.* The seed was sown during the last week of February, 1936, cultivation being the same as for the autumn-sown transplants. Plenty of bulbs weighed 12 oz. each, and harvesting was done at the same time and in the same manner as the autumn-sown crop.

The accompanying photograph illustrates the difference between medium bulbs of the two groups, exactly as harvested, and not considered good enough to grow on for seed.



Onion, Sutton's Solids - *B. long.* Spring grown, 1936 - *B. long.*, sown 1935, transplanted 1936

MILK PRODUCTION

CLYDE HIGGS,
Hatton Rock, Stratford-on-Avon.

SAID a famous lady, in giving cookery instructions, "First catch your hare, then cook it"; and so with Tuberculin Tested (Certified) Milk production—first get your cows and then proceed to milk them. In discussing clean-milk production, far too little emphasis is usually laid on the cow, which is treated as secondary to elaborate buildings and equipment.

I keep Ayrshire cows because, in my early days, there was great difficulty in getting animals that were likely to pass the tuberculin test after six months. There are areas in Scotland free from tuberculosis, and herds that, having been tested for many years, show very few reactors. My herd has been self-contained for some years, and it is now very unusual to have a reactor.

There was at one time a great deal of trouble from contagious abortion. Vaccines having proved useless, I decided to rely on the blood test and dispose of reactors. It is an absolutely reliable method, but expensive, wearying and monotonous. The herd has been free for a long time, but the same precautions are still taken—general herd tests at regular intervals, calving in boxes and isolation until tested seven days after calving. It would be impossible to keep it up without the willing co-operation of the men.

Mastitis—most troublesome of all dairy diseases, because too little is known about it, and it is treated more or less as one of the necessary penalties of the dairy farmer—is effectively controlled by having quarter samples from each cow periodically examined by a research institute; and it seems only a question of a short time before it is eliminated. This, unfortunately, does not apply to summer mastitis, which, I think, is carried by flies and always results in the loss of the quarter; there appears to be no prevention or cure.

It is a remarkable fact that, having the major dairy diseases under control, there is very little trouble from minor ills. To have a cow off-colour is a very rare thing; usually, such trouble is confined to an odd case of stomachache. (Why does Nature mislead cows, as to the capacity of their insides?)

MILK PRODUCTION

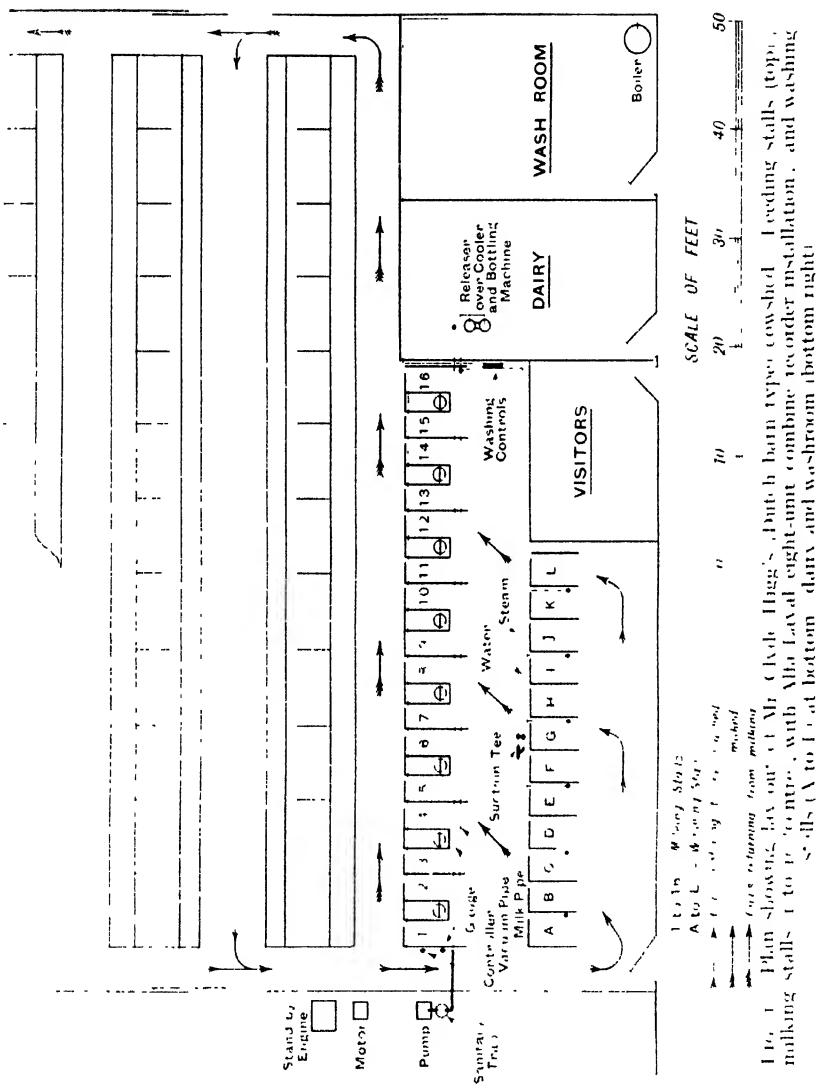
Having a healthy herd is only half the battle; to keep it so is the other. All the land is double fenced by running two strands of wire at least six feet from the boundary fences. This has disadvantages, as some neighbours treat the wire as the boundary, which means that I have to maintain both fences. Every ditch and pond is cut off, and even the river Avon; and drinking troughs supplied from known sources are fitted in each field. This may sound expensive, but if a mole plough is used to draw the pipe under the ground it is really very simple and cheap. Last spring, the cost of pulling a thousand yards of $\frac{3}{4}$ -in. piping 18 in. below ground was £4 10s.

My land consists of three farms—Hatton Rock, Spring, and Blacon; the two former adjoin, but Blacon is five miles away and makes a very good change for dry cows. The whole place is entirely devoted to the production of good milk and any other operation on the farm is secondary to it. I have found it most helpful to use each farm for a specific purpose—Hatton Rock for the milking herd; Spring for rearing young animals; and Blacon for calving and resting. Some time ago we milked and reared at two farms, but the difficulty of proper supervision was too great and the habit that cows have of calving at milking times disorganized the routine.

All the land is grass, and in grass drying, of which I have had considerable experience during the past two years, lies the future of dairying. The economical production of a home-grown food that will maintain a level yield of the highest quality milk is of the greatest importance to the dairy farmer. The problem is not yet solved, but we have made a start.

I have tried so far to give a general impression of my activities as a dairy farmer; but to give a better idea, perhaps, as to how I produce clean milk, it would be well to follow a cow from the cradle onwards.

Let us follow Cinderella—the cow that I use for advertising purposes, the cow that children who come to look round the farm invariably ask to see. Cinderella was born at Blacon, where her mother had been for about six weeks, resting from milk production; the benefit which the cows gain from the change in surroundings and soil is very marked. Her father is one of the three pedigree bulls I keep, all from heavy milking and high butter-fat strains. Ayrshires in my opinion are the finest dairy breed; their value when dead may not be so



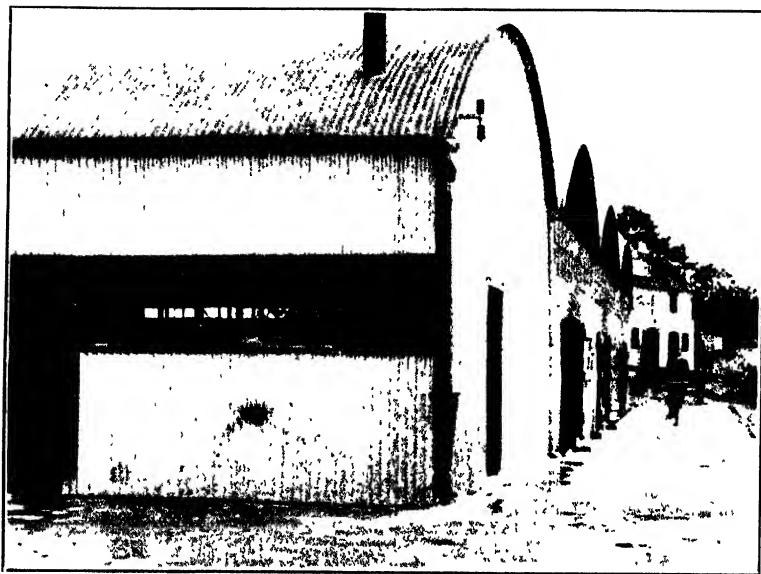


FIG. 2 - Exterior of Dutch barn type Cowshed



FIG. 3 - Feeding Stalls with tubular yokes, but no mangers or curbs

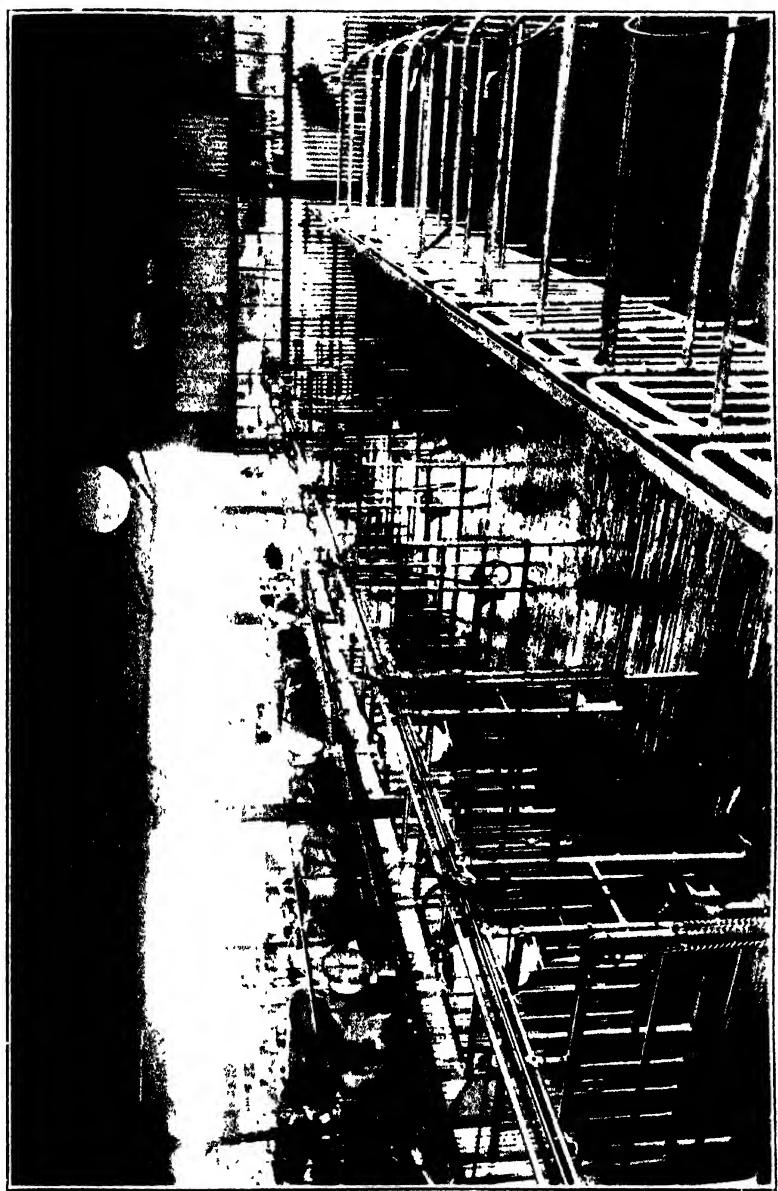


FIG. 1. General interior view of Cowshed looking towards the dairy, showing washing stalls, cattle milking stalls in centre and cows in feeding stalls.

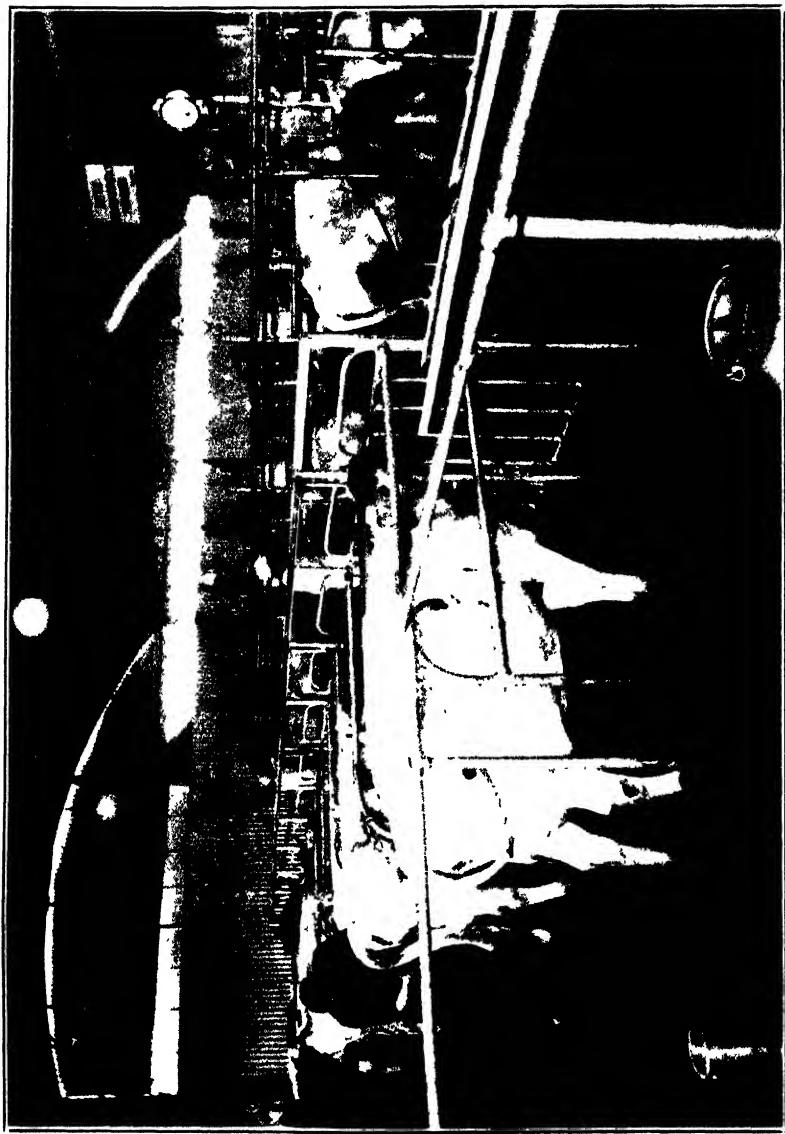


FIG. 5. Interior view of Cowshed showing cows in washing stalls (foreground) and in milking stalls (beyond).

MILK PRODUCTION

high as that of dual-purpose animals, but a dairy cow is most profitable when alive. They are docile (I refer to the cows; the bulls, unfortunately, are most dangerous), hardy and economical to feed. The day after Cinderella was born, her horn buds were rubbed with caustic potash after being surrounded by vaseline. Thus, in later life, she will not be able to hurt her companions even in play. She stayed with her dam for six days and was then reared on a foster mother from among a few misfits and old friends that I keep for the purpose. When about four months old, she went to one of the open yards at Spring Farm with ten more or so calves of her own age. At a suitable time in the spring, after being inoculated for blackleg (I have never had a case, but the preventive measure is so simple that it seems wise to adopt it) she was turned out, and at eighteen months old returned to Blacon to be served as soon as possible by a young bull. After calving, she followed the same routine as her mother and left for the first of her milk production turns at Hatton Rock. If her calf was a bull, it went to the butcher at a standard price when three days old.

For the past two years, I have discontinued "steaming up," without any ill effects on the average milk yield, but with a reduction in the number of milk-fever cases and retained cleansings.

We try to get every cow served six weeks after calving, but, should she return to the bull, she is examined by the veterinary surgeon sometime before her next period; by making this a routine matter I have much reduced the percentage of dry cows.

All animals have access to a complete mineral mixture in powder form, served in large iron bowls, and replenished in small quantities so that it is always fresh. The young cattle consume a lot, but the older ones do not take so much interest in it.

Now to the important business of actual milk production at Hatton Rock. The shed there holds 144 cows, and some details may be of interest, as it was cheap to build and is efficient and economical in use. Previous to building it, nearly three years ago, I had spent, or rather wasted, a lot of money in adapting old buildings that were very expensive to run and difficult to supervise. The shed consists of four corrugated-iron Dutch barns side by side, two of which are shown in Fig. 1. The bays are 90 ft. by 30 ft. and three hold

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48 cows each, whilst the fourth houses the combine milker, washing stalls, cooling and bottling plant, boiler, etc. This plant could deal with three times as many cows as there are at present. Everything is visible from any point of the building, which is 11 ft. high to the eaves, the south gable ends being left open.

Looking first at the sleeping accommodation, each cow has her own stall, but there is one water bowl between two cows. Her name is written in chalk on the top rail of the iron work, with particulars of the rations against it. Tubular yokes are used, and, remembering that each cow is tied and untied ten times a day, no other fitting would be as convenient. There are no mangers or curbs—a most important point—for, after the cows have been milked, they are fond of wandering about before going to their own places, and if there were mangers there would be many accidents. The lack of curbs has justified itself by the total absence of big knees, and the cows lie down in their natural position with the feet stretched out in front of them—a sight that must be seen to be believed. There is no difficulty in feeding hay or dried grass, and concentrates are served by a home-designed machine which gives the ration for 1 gal. by a turn of the handle. One man feeds 144 cows with cake in ten minutes. Baled straw is used liberally for bedding all the year round, for the grass land absorbs an unlimited quantity of farmyard manure. One row of stalls is properly cleaned each day and the ironwork washed with hot soda-water.

The cows always lie in at night, as, with three times milking, finishing at 10.30 p.m., it is not worth disturbing them. Here, perhaps, I may refer to the three-times-milking question. It is a lot of trouble—most work is. Where the farming is mixed, with a few cows fitted into the general run of things, it is certainly not advisable; neither does it seem practical to milk some of the herd twice and some three times, for, to do justice to both sections, it means four milking-times a day. On specialized dairy farms, however, particularly where milk is retailed, it is without doubt the proper system. To the consumer, it gives a level cream content irrespective of the particular milking at which the milk is produced. It enables the farmer to have two-thirds of his milk ready for early dispatch; the yields are higher; and the cow benefits, perhaps, most of all, for she is never struggling along with a distended udder and she is fed oftener and in smaller quantities. In the

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hot weather, she is housed during the most trying part of the day.

It means careful organization of labour, and, of course, the cowmen do no other farm work, being responsible only for milking, feeding the cows and cleaning the shed. For my cows, I have nine men, and one is off each day, except Sunday, when the extra help enables the work to be finished earlier. The head man takes his day off like the others. Milking times are 5.0 a.m., 1.0 p.m. and 9.0 p.m. At the morning and midday milkings there are six men, and at night five. The men work two milkings a day, and the shifts are changed each Sunday. In the morning, one man brings the cows from their sleeping quarters to the washing pen; two men wash the cows; two men milk, and one starts getting the manure out of the shed. This is done with pneumatic-tyred barrows; these are pushed up a ramp and the manure is tipped into a cart. The bury is about 500 yards away from the buildings, and is left to rot for twelve months before use. The labour at the other milkings is the same, except that no cleaning out of the shed is done.

The plan (Fig. 1) covers the most interesting half of the shed. The arrows show the track of the cows from their sleeping quarters to be washed and milked and home again. It is all one-way traffic, and if only human beings would obey road instructions in the way that the cows follow the arrows, accidents would be much reduced! On arrival in stalls A-L they are washed with warm water, which is laid on to each stall and is heated by an injector connected to the boiler in the wash room. After the cows are dried with a cloth—which is disinfected after use for each cow—the fore milk is drawn on to the floor. An important point here is that the floor of the washing pens is dished under the cows' udders, so that the washers are standing in the dry and the dirty water and fore milk go straight away to the drain. An indicator shows the milker which cows are washed, and he opens the gates as required. There are sixteen milking stands, and the twelve washing-stalls keep them comfortably filled. The cows are never fed whilst being milked.

The combine system of milking is, I think, as great an improvement on machine-milking as this is over hand-milking. It is cleaner and quicker than the bucket type and leaves the cow with a dry bed to lie on. The milk is weighed in the glass container whilst she is being milked, and recorded.

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On these totals, the rations for the following week are based. As soon as the milking is finished, the machine is flooded first with cold water, then with hot water, and finally steam-sterilized.

When the milk reaches the dairy it comes under the care of the dairyman. It goes by gravity over a direct-expansion cooler into a filling machine, then into the bottles, and so to the cold store. The filling machine is only a simple two-head one, but it bottles the milk quickly enough to keep pace with the milking.

The dairy work is also done in shifts by seven men. One is head dairyman; five have a van each for delivery; one is spare, taking the place of each of the others in turn on their day off. The milk is only delivered once daily, so that the drivers take one midday and one evening dairy-duty each week.

In the wash room is the coke-fired boiler with a single-cross tube. It is well lagged with asbestos and the fire never goes out except through carelessness. The water is very hard, but the boiler is kept in good condition by putting half a pint of boiler enamel in the feed tank each day. There are two sterilizing chests, two washing-up tanks, and a bottle-washing machine. This last is of the brush type with a large rotary soaking tank. I had a small hydro plant that certainly saved a lot of labour, but never washed a bottle clean. As soon as the roundsmen return, they join in washing the bottles; and, on a two-brush machine, can do 1,500 an hour, these being afterwards sterilized in the chests.

The plant is electrically driven, two-horse-power motors being used for everything. In some cases they are larger than necessary, but the interchangeability in case of breakdown is a great asset. As the electricity occasionally fails, there are standby engines that are run each week to ensure that they are in working order.

The water supply at Hatton Rock comes from an unfailing and perfect spring 700 yards away. A slow running 3-in. single-cylinder, double-acting pump lifts the water against a head of 150 feet. Cows cannot make milk without water, and, to guard against failure of the supply, there are two pumps, two motors and an engine.

Five Austin vans deliver the milk, and are away by 6.30 a.m. each morning. The rounds average from 30 to 40 miles a day. Customers are always attracted by a well-



Fig. 6. Interior of the Dairy, showing direct expansion cooler and filling machine.

To face page 838.



FIG. 7. The Bull playground



FIG. 8. Laying water-pipes with a mole plough

MILK PRODUCTION

kept van, and I find that the cheapest way of keeping mine up to the mark is by exchanging them when they have done 20,000 miles.

A sample of milk is taken at each milking and tested for *B. coli*. Until recently, plate counts were carried out, but we are now changing over to the Methylene Blue test.

To run a substantial retail round efficiently entails office work, but this should be kept as light as possible. I have a dread of the usual type of milk book that the customer can never find and that always has an unhealthy smell, so I designed a system of my own, and it has worked very well for ten years. We have loose-leaf ledgers measuring 24 in. by 15 in., and each customer has three sheets in them. The first is divided into twenty-eight squares in four rows of seven—one for each day of four weeks. The second is a yellow sheet divided into four with the days of the week on each, and the third a white sheet for the office copy. At the beginning of the week, the office staff make out the small tickets with the customers' probable requirements, which go through to the yellow and office copy by carbon paper. Each day the appropriate tickets are torn out, tied together and counted to make a round book for the driver. Should the customers delivery differ from the forecast, it is noted in a book which also contains receipts and order forms for cream, etc., a different colour for each round. On Friday midday, the books are closed, the bills totalled, the sales, receipts and debtors balanced so that the financial position can be gauged at any time. The bills go out with the vans on Mondays. Little trouble is experienced with bad debts, because I never let a new customer owe more than a fortnight unless proper arrangements have been made. Some take offence at being asked for money—usually because they have not got it!

With all this care in production, it might be thought that the milk would sell itself—far from it! It is only by constant advertising that we are able to increase our sales as becomes a prosperous business. The prices are modest, too much so, I am often told, but they leave a reasonable profit. For Tuberculin Tested Certified Milk, 7d. a quart in the summer $7\frac{1}{2}$ d. in the winter. Pints are 4d. all the year round. The difference in the pint and quart bottles is to encourage people to buy their whole supplies from me rather than to take a pint for the baby until it grows up and return immediately afterwards to their old milkman.

MILK : REPORT OF REORGANIZATION COMMISSION FOR GREAT BRITAIN

THE Report of the Reorganization Commission for Milk for Great Britain* has just been published as No. 44 of the series of Orange Books on Agricultural Marketing.

The Commission was appointed jointly by the Minister of Agriculture and Fisheries and the Secretary of State for Scotland on February 11, 1935. Mr. A. E. Cutforth, a former President of the Institute of Chartered Accountants and a member of the previous Milk Reorganization Commission (for England and Wales), was Chairman. The other members were Professor A. W. Ashby, Professor of Agricultural Economics, University of Wales, Aberystwyth, who had also served on the earlier Commission, Sir Iain Colquhoun, Sir John Orr, and Miss D. S. Tomkinson, Chairman of Western Federation of Women's Institutes. The terms of reference of the Commission required them to examine the working and effects over the past three years of organized milk marketing in Great Britain, and to make recommendations for further improvement. They were also asked to consider whether it was desirable to provide for closer co-operation between the several schemes, or for amalgamation or other adjustments, and, if so, to suggest the changes that should be made; and to report on the question of closer co-operation between the Milk Marketing Boards in Great Britain and the appropriate authorities in Northern Ireland.

As the Commission point out in an introduction, they have, at the invitation of Ministers, interpreted their terms of reference liberally. Their proposals would entail important changes of principle in the organization of milk marketing, and new legislation would be required to give them effect.

The Report is in four parts, consisting respectively of a short account of the four schemes; an appraisal of their effects; a discussion of certain fundamental principles involved in the organization of milk marketing; and the Commission's recommendations for the future. It is unanimous, but is followed by a short Addendum signed by Sir John Orr.

The survey of the schemes and their effects contained in Parts I and II, leads the Commission to the general conclu-

* *Milk : Report of the Reorganization Commission for Great Britain.* Published by His Majesty's Stationery Office as Economic Series No. 44. price 1s. net, or 1s. 5d. post free.

REPORT OF THE MILK REORGANIZATION COMMISSION

sions that the schemes have been of great value to milk producers and to agriculture as a whole; that distributors as a body have benefited; that manufacturers of milk products have not been adversely affected; and that the cost of the advantages gained has been borne by consumers in the form of higher prices for liquid milk, although they, too, may in the long run gain by the stability given to the milk market, as they have certainly gained from the low prices ruling for milk products in recent years. One interesting point made is that the increase in the volume of milk sold since the schemes came into operation is apparently not due to any abnormal increase in production.

In discussing the broader issues raised by the schemes, the Commission express the view that the chief objects of organized milk marketing should be to ensure equity between all sections of producers and between all the interests concerned in the milk industry; to secure that milk is produced and distributed efficiently and economically; and to increase the consumption of liquid milk, especially among those sections of the population that need it most.

At present the prices paid by wholesale buyers, and thus the prices received by producers, are determined by the decisions of Boards consisting, for the most part, of elected representatives of producers. The Commission suggest that this arrangement, even with the statutory safeguards, is not calculated to assure buyers and consumers, or even particular sections of producers, that their interests are sufficiently considered. It is also urged that elected producers' Boards may be deterred from encouraging progress towards more efficient production in cases where this might adversely affect existing interests; and, further, that they would not be a suitable agency for developing improvements in distribution.

The Report recognizes that the producers' Boards are fully aware of the need for increasing the consumption of liquid milk, and pays a tribute to their collaboration in publicity schemes and in the supply of cheap milk to school children. It points out, however, that the immediate financial interest of producers may well lie in raising liquid milk prices in the ordinary market. The pressure to raise liquid milk prices, it is suggested, must constitute a serious and even an increasing risk, so long as the value of manufacturing milk remains at current low levels, and so long as the volume of milk marketed tends to increase.

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The Report discusses the various policies that have been advocated to deal with the situation created by an output of milk considerably in excess of the current demand for liquid milk. The Commission do not favour the plan by which basic shares in the remunerative liquid-milk market would be allocated among producers; and, while they make no recommendations regarding import policy, they point out the limitations as well as the possibilities of quantitative regulation, increased import duties and the levy-subsidy systems.

The Commission's proposals are based on certain broad principles. The first is that price control should be used as an instrument for promoting a planned policy for the milk industry in the interests of producers and of the community as a whole. The second is that, as price is the vital factor influencing production, distribution, manufacture and consumption, the control of prices should rest in impartial hands, and not in those of one of the interested parties. Thirdly, the producers' Boards should be retained as an integral part of the new system, since they have proved their efficiency as administrators and as representatives of producers.

The Report recommends that the new organization of the industry should include the establishment of a permanent Milk Commission, consisting of five members appointed by the Minister of Agriculture and Fisheries and the Secretary of State for Scotland, after consultation with the Departments responsible for other interests. Its chief duties would be to assist the Government by planning a milk-production policy adjusted to the nation's needs, by supervising the implementation of that policy, and by framing measures designed to increase the consumption of liquid milk. In formulating policy the Commission would consult with, and assemble information from, producers', distributors', and manufacturers' organizations. It would report annually to Parliament through the appointing Ministers, and would submit recommendations to the Government when called upon to do so or on its own initiative.

It is proposed that the English Milk Marketing Board should be retained in much the same form as at present. A single Board is recommended for the whole of Scotland in place of the three existing and two projected Boards; but Scotland would be divided into regions analogous to those in England and Wales. The two Boards would retain all executive and administrative functions exercised by the present Boards,

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except that of determining prices; and they would be under a statutory obligation to enforce, through their terms of contract, the prices fixed by the permanent Commission. They would also assist the Commission with their advice and with statistical and other information.

Other recommendations affecting the constitution of the marketing Boards include reforms in electoral procedure, of which the chief are the introduction of postal voting instead of proxy voting; the co-option instead of election of special members of Boards; the substitution of regional general meetings and a central delegate meeting for the present system of general meetings of all producers; and the creation of producer-retailers' advisory committees.

Proposals are also made for more closely co-ordinating the various interests concerned in the milk market, including the establishment of a Standing Co-ordination Committee, consisting of representatives of the two Boards and of Northern Ireland with an independent Chairman.

The price system recommended differs in certain important respects from the present arrangements. The prices payable to producers as well as the prices paid by wholesale buyers would be fixed in advance for each yearly contract period. Producers' prices would thus be firm prices; they would be subject to no deduction, except in respect of transport, and they would be payable for the entire output offered for sale. The permanent Commission would fix these prices at such levels as, according to its calculations, would bring into the market the quantities of milk required, suitable differences being prescribed according to the quality of the milk and the season and region of its production. As a result, each producer would be able to tell in advance exactly what price he would receive for each gallon of milk of a given quality produced in each month, and could plan his production accordingly. It is contended that this added security would be of great benefit to producers.

The volume of production to be aimed at would necessarily depend on the volume of milk expected to be sold respectively for liquid consumption and for manufacture, and on the unit returns to be expected from such sales, together with any financial assistance that might be available from the Exchequer. Thus, the permanent Commission, in determining prices, would have to make careful estimates with regard to certain variable factors. The Report claims that it should

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be possible to forecast and balance annual income and expenditure within a fairly small margin of error; but it recommends either that provision should be made for a reserve fund, or that the State should guarantee temporary overdrafts, which could be met by price adjustments for the ensuing year.

The price policy which the Report recommends is based upon the principle that liquid milk should be made as cheap as possible; but it is not proposed to fix prices, to producers, that would reduce the present volume of production. The ordinary wholesale price of liquid milk would consist of the producer's price, plus an addition representing the loss incurred in the disposal of the milk that can fairly be regarded as the reserve required to maintain a steady supply to the liquid market; this is tentatively estimated at 20 per cent. of the amount actually consumed. It is recommended that the loss in disposing of any remaining supply should be a charge upon the State. This, together with the proposal that retail prices should, in general, no longer be regulated by the terms of the Boards' contracts, should lead to some reduction in prices.

In addition to these concessions to the ordinary purchaser of liquid milk, the Report recommends that the permanent Commission should institute further experiments, comparable with the Milk-in-Schools Scheme, for the sale of milk at specially reduced prices to sections of the population whose consumption is low. Certain general suggestions are made as to the lines upon which these experiments might be based. It is recommended that the State should subsidize schemes for "assisted price" milk as a matter of social policy.

As regards prices for manufacturing milk, the Report recommends that the present system of charging according to the value of the final product should be retained, and that wherever possible prices should be fixed on the basis of a formula relating to the current price of the product. Slight adjustments might be made in order to encourage the production of the commodities returning the highest values for the milk used in them.

As regards variations in producers' prices, the Report suggests that these should be fixed with the ultimate object in view of securing the greatest efficiency and economy in production; and it is recommended that regional variations should be designed to encourage the production of milk where

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it can most cheaply be produced, having due regard to the costs of transport. Seasonal price variations should take account of the costs of manufacture as well as of production. It is recommended that changes in the levels of prices should be made gradually, so that there would be no sudden changes in the location of production.

In order to raise the quality of milk, it is proposed to establish a system of standard grades covering all sales; the minimum standard that may be sold for liquid consumption should gradually be raised. Each producer should be paid for his milk according to its quality, whether or not all milk of the higher grades could be sold at higher prices. Recommendations are also made regarding level delivery and other special service premiums, and the assessment of producer-retailers' contributions.

As regards the transport of milk, it is proposed that the Boards should operate a system of pooled transport charges. This would enable the Boards to reduce costs by cutting down unnecessary transport and also to allocate transport charges more equitably among producers. A general outline of a system of pooling on the basis of zones surrounding consuming centres is put forward, but the details are left to the Boards to settle.

With regard to distribution, the Commission's proposals are less specific, but the Report expresses the conviction that substantial economies could be secured through the reorganization of distribution. In particular, the need for concentrating urban supplies in wholesale depots, and for various improvements in retail organization, is emphasized. It is recommended that the permanent Commission should conduct a detailed investigation into the whole question of the organization of the milk supply service and submit a Report.

In his Addendum, Sir John Orr emphasizes the importance of increasing milk consumption, and, while he recognizes that the proposals made in the main Report (which he has signed) are "an important step in the right direction," he recommends that the permanent Commission should be required to submit a special report to the Government, after two years, showing how far the public-health objectives have been achieved and what further changes, if any, are necessary in the public interest.

COMMERCIAL FRUIT-SPRAYING DEMONSTRATION IN WEST NORFOLK

J. TURNBULL,

Ministry of Agriculture and Fisheries.

A SERIES of spraying demonstrations, covering the 1935-36 season's programme, was carried out in co-operation with Messrs. H. Goude (then Horticultural Superintendent to the Norfolk County Council), E. Skillman, his assistant, and J. E. Spickernell of the Ministry. The object was to demonstrate how thoroughness in spraying can be achieved easily and rapidly by using higher pressure and short lances fitted with double nozzles, giving a fine driving spray of long range, as designed by the writer and described in this JOURNAL for August, 1934.

Mr. A. Image, of Oxburgh Hall, near Wisbech, kindly placed at our disposal a 10-acre plantation of Bramley and Emneth apples, which he said had never cropped satisfactorily, together with his staff, spraying plant and the necessary materials. Three acres had Careless gooseberries between the trees and the remainder had no undercrops.

The plantation had received potash for several years and the trees looked poor. Five cwt. per acre of sulphate of ammonia or nitro-chalk were given, and part of the land was ploughed in February.

The spraying plant consisted of a $3\frac{1}{2}$ h.p. Demon outfit, 13 years old, equipped with water pump, mixing and spraying tanks. When in good working order, it was found capable of delivering $7\frac{1}{2}$ gal. per min. at a pressure of 400 lb. per sq. in. The delivery pipes consisted of about 450 ft. of $1\frac{3}{8}$ -in. portable mains with brass couplings and $\frac{1}{2}$ -in. rubber hoses, each 300 ft. long; and 4-ft. wooden-handled lances, fitted with double nozzles, giving the required type of spray, were used. The sizes of discs tried, as measured in sixty-fourths of an inch, were $4\frac{1}{2}$, 5 and $5\frac{1}{2}$,* giving an output from each double nozzle of 2.2, 2.7 and 3.5 gal. per min. respectively, at a pressure *at the nozzle* of 300 lb. per sq. in.

* It was agreed at a conference of spraying machinery manufacturers held at the Ministry in May, to adopt this method of numbering discs as standard.

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The capacity of the pump was sufficient to carry three double nozzles of the first size, but only two of either of the others.

Tar Oil. No information was available as to the pests present and it was decided to spray with standard tar oil at $7\frac{1}{2}$ per cent. (3 in 40). A start was made on December 17, but only 2 hours' spraying was done that day, owing to frost. Later, 4 hours' and 2 hours' work were done on other days. Many delays were caused by loss of pressure and blocked nozzles, due to last year's spray deposit in the pipes and hoses. One man mixing, two boys pulling hoses, three men spraying, did $3\frac{1}{2}$ acres with 1,600 gal. in the 8 hours. Size No. $4\frac{1}{2}$ discs were used. The pressure at the pump was generally 350 lb. per sq. in., but probably not more than 250 at the nozzles. The rest of the plantation, except four rows, was sprayed by Mr. Image in January with the usual long lances.

Petroleum. This spraying was commenced on March 24, to allow an interval, supposed to be necessary before the next spray. Petroleum emulsion was used at 5 per cent. (2 in 40). One man mixing, two boys pulling hoses and two men spraying, with the same discs and pressure as for the tar oil, did $3\frac{1}{2}$ acres with 1,160 gal. in 5 hr. Later, $5\frac{1}{2}$ acres were sprayed with 2,040 gal. in 9 hr. Two rows that had received tar oil and two rows that had not were not sprayed. Thus there were two rows that had received tar oil and no petroleum, two rows that had received petroleum and no tar oil, and two rows that had not been sprayed.

Green Flower. In April, extensive markings by Apple Blossom Weevil, and, on the unsprayed trees, a fair number of buds bored by Tortrix caterpillars were found. On April 15, lime-sulphur at 3 per cent. ($1\frac{1}{2}$ in 40) was used, the start being delayed by rain. By this time the plant was working well, but the freshly-ploughed ground made the work difficult. One man mixing, three hose-pullers, three men spraying, did the whole 10 acres with 2,560 gal. in $7\frac{1}{4}$ hr.

Pink Bud. On May 5, the unsprayed trees showed Weevil and Tortrix marks as before. Very few Capsids were seen and these were in the first stage. No Capsid and many fewer insect markings were found on the sprayed trees. No Scab was seen. A spray consisting of lime-sulphur $2\frac{1}{2}$ per cent. (1 in 40), lead arsenate paste 5 lb. (2 lb. in 40) and

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spreader 100z. (4 oz. in 40 gal.) was applied. The lime-sulphur was reduced to half-strength over the gooseberries. An attempt to use the largest discs (size 5½) failed, because the pressure at the nozzles dropped and the spray would not reach the tree tops. The pressure at the pump remained constant, therefore the loss was due to the fact that the very long hoses would not carry the increased quantity required by each nozzle, without an excessive loss (200 or 250 lb.) of pressure. Size 5 discs were then fitted and gave a better spray than size 4½, but the pump would not carry three double-nozzles fitted with them. One man mixing, two boys hose-pulling and two men spraying, did the whole 10 acres (except six trees) in 10½ hr. with 2,660 gal.

Petal Fall. On May 26 it was seen that the Apple Blossom Weevil had done little damage, but it was decided to commence banding at once, to reduce the attack next season. On the unsprayed trees were found many Tortrix caterpillars, a fair amount of Capsid on the Emneth, very few on the Bramleys. There was a fair amount of Red Spider and some eggs on both varieties and a trace of Scab on Bramleys. No Capsid and no Red Spider were found after tar oil and petroleum, but a few Capsid on the Emneths after petroleum and no tar oil. There were still some Tortrix caterpillars on the sprayed trees. No sawfly scars were seen. It was decided to spray with lime-sulphur at 1 per cent. ($\frac{2}{3}$ in 40), but spreader was added at Mr. Image's request. Nicotine and arsenate were added for the rows not sprayed with tar oil and petroleum, to reduce the "carry over" of insects. The Emneths over the gooseberries were not sprayed.

The pump pressure was raised to over 400 lb. per sq. in. and it was estimated that there was 300 lb. at the nozzles. One man mixing, three hose-pullers, three men spraying, did the first 5 acres with 1,080 gal. in 3½ hr. The remainder of the piece was sprayed in various ways owing to the treatment of the unsprayed trees, and the costs of these are omitted, as being no part of the original programme. No spray damage followed any of these applications.

Dusting. It was not convenient to do any more wet spraying, but it was decided to dust against Scab. The weather during May had been unfavourable to the development of the Scab fungus, but conditions changed late in the

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month. June was very unsettled and July was very wet, and Scab became rampant on the unsprayed Bramleys. Mr. Image made three applications of dust on June 19, July 3 and 18—the dates being later than intended, owing to adverse weather conditions. A copper-lime dust (actually a Bordeaux dust) used on 4 acres, and, on each occasion, one man leading the horse and one man dusting, took 2 hr., using 125 lb. The remaining 6 acres were done with sulphur dust.

On July 28 it was found that the copper-lime-dust had caused russetting on the Bramleys, but not on the Emneths. The fruit dusted with sulphur was very bright. The leaves on the non-fruited spurs were in very fair condition and the manuring and cultivation had not proved excessive, in spite of the wet summer. On the trees that had only received lime-sulphur at mid-April, the Bramleys were 25 to 30 per cent. scabbed, but the Emneths only 10 per cent. and that very lightly. Where the full programme had been given, not more than one or two scabbed apples could be found on any tree and none on many trees. Insect damage was also slight. No special sprays had been used against Codlin Moth, since none had been caught.

Cost of Labour and Materials. As the whole plantation was not sprayed in the same way, the cost per acre of the full programme is given. A proportion of the time spent in moving the pipes, etc., has been added. No allowance has been made for the proportion of the foreman's time, nor for the cost of using the plant.

Wash	Quantity Gal.	Strength	Material	Labour			Total Cost £ s. d.
				Spraying	Moving		
Tar Oil ..	.. 457	7½%	1 15 0	0 8 0	1 9	2 4 9	
Petroleum ..	.. 354	5%	1 7 0	0 4 5	1 9	1 13 2	
Lime-sulphur ..	.. 256	3%	0 6 0	0 3 1	1 5	0 10 6	
Lime-sulphur ..	.. 266	{ 2½% 5 lb. 10 oz.	{ 0 5 3 0 7 1 0 4 4	0 3 1	1 5	1 1 2	
Lead Arsenate ..							
and Spreader ..							
Lime-sulphur and ..	.. 216	{ 1% 5 oz.	{ 0 1 8 0 1 11	0 2 10	1 5	0 7 10	
Spreader ..							
Copper-lime ..	.. 31 lb.	—	0 7 6	0 0 9	—	0 8 3	
Do. ..	.. 31 lb.	—	0 7 6	0 0 9	—	0 8 3	
Do. ..	.. 31 lb.	—	0 7 6	0 0 9	—	0 8 3	
TOTAL		..	.. 5 10 9	1 3 8	7 9	7 2 2	

The quantity used at petal fall was light, partly because of the size of some of the trees, but mainly because of the

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higher pressure. The quantity of copper-lime-dust used was rather heavy. The labour required for the tar-oil spraying was heavy on account of the time wasted in clearing blocked nozzles, etc. This waste time could have been saved by attention to the equipment in the previous season. The cost of the spreader in the petal-fall spray was greater than the cost of the lime-sulphur, and the object of using it is not clear. In comparing the cost of dusting with that of wet spraying, it has to be remembered that the whole piece has to receive the dust, whereas if a late spray had been applied only certain varieties (in this case Bramleys) would have been treated. The extra cost of dust has to be set against the advantage of quick work, requiring little labour.

The time during which spraying must stop, because the pipes, etc., are being moved, is seldom realized. It was noted on two occasions. In March, when it was wet and unpleasant, it took 1 hr. to collect the pipes from the orchard in which they had been left, 2 hr. to move them to the orchard to be treated (including laying out and filling), and 1½ hr. to move and fill the pipes again, making 4½ hr. for the 10 acres. In May it took 3½ hr. in all. The labour employed in moving the plant for the 5 sprays on the 10 acres cost £3 17s. 6d. or 7s. 9d. per acre. Out of 21s. 5d. paid for labour on the 5 sprayings, 5s. 11d. was paid for pulling these very long hoses. Taking the 7s. 9d. and 5s. 11d. together, as the cost of moving this type of pipes and hoses, this amounts to 13s. 8d., or very nearly one-half the total wage bill of 29s. 2d. per acre for spraying. Labour on dusting is excluded.

Grading. It was impracticable to grade any large proportion of the crop, but it was felt desirable to grade samples, as an indication of the proportion damaged by insects and disease and the proportion coming up to National Mark standards.

The Emneths were picked in July, and samples were graded on July 28. There were so few blemishes on any of the trees, that the crop from only two trees was graded. The fruit had not been thinned and was small and immature, so that it was decided to grade to Extra Fancy standard for blemish only and to disregard size.

<i>Spray Programme</i>	<i>Under $\frac{1}{2}$ in. blemish</i>	<i>Over $\frac{1}{2}$ in. blemish</i>
Full	300 lb., 97%	8 lb., 3%
Part	250 lb., 86%	40 lb., 14%

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Over 90 per cent. of the crop receiving the full programme was entirely free from blemishes due to pests or disease. The blemishes were mainly due to *Tortrix* caterpillar damage. There were very few Capsid marks and only two apples with Scab.

Picking of the Bramleys commenced on September 14 and samples were graded on the following day. The crop was remarkably uniform and there was no object in grading a large number of trees. For the sake of brevity, the Extra Fancy standard is taken in the table below as including apples with under $\frac{1}{4}$ -in. blemish, though no apples may have a spot of Scab larger than a pin's head. The crop from two trees receiving the full programme, one tree receiving half-strength lime-sulphur at pink bud and sulphur instead of copper-lime-dusts (modified programme), and one tree (which received only the first lime-sulphur and three sulphur dusts), was graded, with the following results:

Spray Programme	Under $\frac{1}{4}$ in. blemish			Over $\frac{1}{4}$ in. blemish		
	Extra Fancy	Small	Damaged	Apple scab	Insect marks	
Full ..	373, 72%	93, 18%	27, 5%	13, 2½%	14, 2½%	
" ..	200, 75%	40, 15%	14, 4½%	6, 2½%	8, 3%	
Modified ..	380, 77%	40, 8%	35, 7%	10, 2%	30, 6%	
Part sprayed ..	75, 24%	13, 4%	14, 4%	107, 35%	100, 33%	

The figures for the "part sprayed" tree indicate that the crop would have been of little value, if it had not been sprayed. Many apples had both Scab and insect marks and it was difficult to know in which grade to place them. Of those graded as insect marked, more than half were due to Capsid and the remainder to *Tortrix*. Many of the scabbed apples were cracked, although the attack was mainly a late one.

Taking the sprayed trees as a whole, only from 5 to 8 per cent. showed blemishes due to insects or disease, with practically no Capsid marks. The Extra Fancy and Small apples contained less than 3 per cent. with very small marks. The damaged apples were marked by wind damage, frost russet, bruising and the like. About 85 to 90 per cent. of the Bramley crop was entirely unmarked by pests or disease.

The proportion of the crop attaining National Mark Extra Fancy Standard was in excess of 70 per cent. and would have been more, but for the small apples. The proportion of small apples varied in different parts of the plantation, and may have been due to any one of a variety of causes.

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The figures for the tree that received the modified programme are quite inadequate to provide a comparison of the different materials used, but they do show that no general disaster occurred by reducing the pink bud spray to half-strength and substituting sulphur for copper-lime-dust. The apples from the trees dusted with sulphur had a very much brighter appearance than those from the trees dusted with copper-lime, many of which had a very dull appearance.

Discussion. The spraying programme was carried through satisfactorily and special thanks are due to the fruit foreman, Mr. H. F. Harding, for his keen interest and help, as well as to the men, for the thorough manner in which they carried out the work. Once the plant had been got into good working order and the men had become accustomed to the use of the new sort of spray, they very much preferred it. It will be seen from the figures that, when using lime-sulphur, each man sprayed an acre in about 2 hours. So far from being a discouragement, such speed of work is a definite encouragement and results in the men taking considerably more interest in the work and, therefore, doing it better.

The exact nozzle output used is of immense importance in commercial work and merits the closest attention. The larger the output, the more quickly and easily can the work be done, but if it is too large for the conditions, waste of material will result. The nozzle output, other conditions remaining the same, is regulated by the size of disc fitted and so small a difference as half a sixty-fourth of an inch makes a big difference in results. The pump output ($7\frac{1}{2}$ gal. per min.) was sufficient to carry two double nozzles with size $5\frac{1}{2}$ discs (0.085 in.), but the excessive length of hose (300 ft.) would not carry the quantity ($3\frac{1}{2}$ gal. per min.) without excessive loss of pressure, and this made it impossible to ascertain whether the men could use so large an output in the conditions. The best spray that could be got through these long hoses was 2.7 gal. per min. (size 5 discs). This size would do when only two men were required to spray, but the total output would then be only 5.4 gal. per min. When three men are available for spraying, the most economical discs to use with these nozzles and this plant, are $4\frac{1}{2}$ size (0.070 in.) giving a total output of 6.6 gal. per min. It was shown that three men could use this output satisfactorily. It would be impossible to use more men without reducing each man's output and

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thereby curtailing the amount of work he could do and making the work more difficult.

It should be pointed out that these small-bore portable pipes and very long hoses are quite unsuitable for high pressure work. The heavy cost of handling them and the impossibility of using a really large spray with them have been mentioned. Moreover, the total loss of pressure with a moderate spray is at least 100 lb. per sq. in. In addition there is the great waste of time when spraying must stop while they are being moved. This in itself is one of the most frequent causes of failure in spraying because it is impossible to get round the farm quickly enough. These disadvantages can be largely overcome by using two sets of larger-bore, lighter, portable pipes with quick-thread flexible couplings and short hoses, so that each man can manage his own hose and move to the second set of pipes which has been placed in position by an extra man while spraying is in progress. The extra cost of pipes will be offset by the saving in hoses. A still better method is to use underground pipes, but these cost £5 or £6 per acre, plus cost of laying.

Reference has been made to the russetting caused by copper-lime-dust on Bramleys and the eventual dullness of some of the fruit by picking time. It is very difficult to use this dust, especially in a wet season, without causing this damage, although some fruitgrowers are able to do it. It is well known that application when the fruit is damp, or blowing the dust directly on to the fruit, will cause it. It is not so well known that driving the machine up every row may be responsible, because this gives every apple several coats of dust. It is necessary to watch how far the dust is drifting and to give good cover so as to avoid dusting trees twice over. Very much larger trees than these have been dusted satisfactorily with only 20 lb. per acre, when going up every fourth row.

The most serious trouble in this plantation was Apple Scab on Bramleys. In spite of one lime-sulphur spraying in the green-flower stage and three sulphur dusts later, the "part sprayed" tree had 35 per cent. of scabbed apples. Apple Blossom Weevil was very plentiful in April and might do a lot of damage in some seasons. The tar oil and lead arsenate gave a good control of caterpillars, mainly Tortrix. Petroleum following tar oil gave an almost complete control

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of Capsid Bug and Red Spider. The effect of petroleum, without the preceding tar oil, was not quite so good. Possibly fewer dustings might have been given after three lime-sulphur sprays for Scab, but the summer was so wet that it did not seem worth risking. Apple Sawfly and Codling Moth were not seen.

It is frequently stated that the soil in this district is not suitable for apple growing, that crops are not heavy enough, that the conditions make it specially difficult to control Apple Scab, and that fruitgrowers who secure heavy crops of clean apples are "lucky." The fact that a very heavy crop of clean apples, including Bramleys, which graded over 70 per cent. National Mark Extra Fancy, has been grown as the result of only one season's spraying and manuring, is at least an indication of the source of the successful fruitgrower's "luck." The crop could hardly have been heavier anywhere for the size of the trees, and the appearance of the foliage is quite as good as any likely to be found elsewhere.

Summary. 1. A complete season's spraying programme was carried out in a 10-acre apple plantation in West Norfolk. Many fruitgrowers saw the work being done. The land was also manured and ploughed.

2. The existing spraying plant was used, but it was fitted with short lances and double nozzles, giving a different type of spray in larger quantity, and the working pressure was raised. Fewer men were employed.

3. The men found the work easier to do, although they covered the ground much more quickly than usual, and they preferred the method of working.

4. Detailed costs are given and the total expenditure was moderate.

5. A very heavy crop, 85 to 90 per cent. free from markings by pests or disease, was grown. The Emneths were small in July and should have been thinned. The Bramleys graded out over 70 per cent. National Mark Extra Fancy Grade and this figure would have been higher but for the small apples.

6. It is suggested that, with larger-bore portable pipes and shorter hoses, a higher effective pressure would be obtained. This would permit an appreciable saving of material and labour.

A STUDENTS' ANNUAL COMPETITION DAY

T. W. McDougall-Porter, M.C., N.D.A.,
late Principal, Kent Farm Institute.

THE Kent Farm Institute at Borden, near Sittingbourne, opened its doors for the first time as a training centre for young men in the autumn of 1929. Courses of instruction are provided in Agriculture, Commercial Fruit Growing and Poultry Keeping, starting in October and finishing in July. From the outset, the Kent Institute has devoted a good deal of the period of training to practical instruction on its 250-acre farm, with the object of turning out lads who are able to find employment on farms as agricultural workers, and, later, to obtain situations as farm foremen or bailiffs, or to take farms of their own. The demand for the students on leaving the Institute has, from the first, been very keen, and, at the time of writing, no student who has completed his course or courses is out of employment, or has been so for any length of time. Already 16 of the past-students have obtained situations as foremen or farm bailiffs, while 20 have their own farms and a number are working on their fathers' farms.

Competitions in practical work have been held in many counties at the end of a particular course of instruction, e.g., following a course of instruction in thatching or hedging or sheep-shearing, but the Competition Day at the Kent Farm Institute differs from all others in the fact that a number of different competitions are being held on the same day. They have aroused considerable interest in the district, and it has been suggested that something on the same lines might take the place of the old-time ploughing matches that are fast disappearing in most districts.

The first Competition Day was held in March, 1931. At that time there were only 20 students at the Institute, but for the last three years the Institute has been full with 40 resident students, so that the Competition Day has become a much bigger affair. March is by no means an ideal month, but it was chosen in order that a pruning competition might be included. The earlier competitions were held on a day early in the week, but for the last two years the first Saturday in March has been chosen. The choice of a Saturday enables a number of old students to be present, and each year more

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farmers bring their fruit men to witness the apple-pruning competition, which is held in the afternoon.

Every student has had to enter for at least one competition, but the majority enter for all three that are open to their particular course. The competitions are:—

Agricultural Course ..	Thatching ; manure-sowing ; milking.
Fruit Course ..	Spraying ; pruning ; apple packing.
Poultry Course ..	Plucking ; trussing ; poultry judging.

No entry fee is charged. Prizes of 6s., 4s. and 2s. are awarded in each class, while additional prize money is given for a class confined to students who have done little or no milking before coming to the Institute. The prize money, amounting altogether to about £6, is obtained from the farmers in the district, and is usually collected in small sums of 2s. 6d. or 5s. in the Sittingbourne market. Three Challenge Cups are also awarded to the students gaining the most points in the three competitions of each course. The winners of the Challenge Cups are presented with a miniature cup, which they retain.

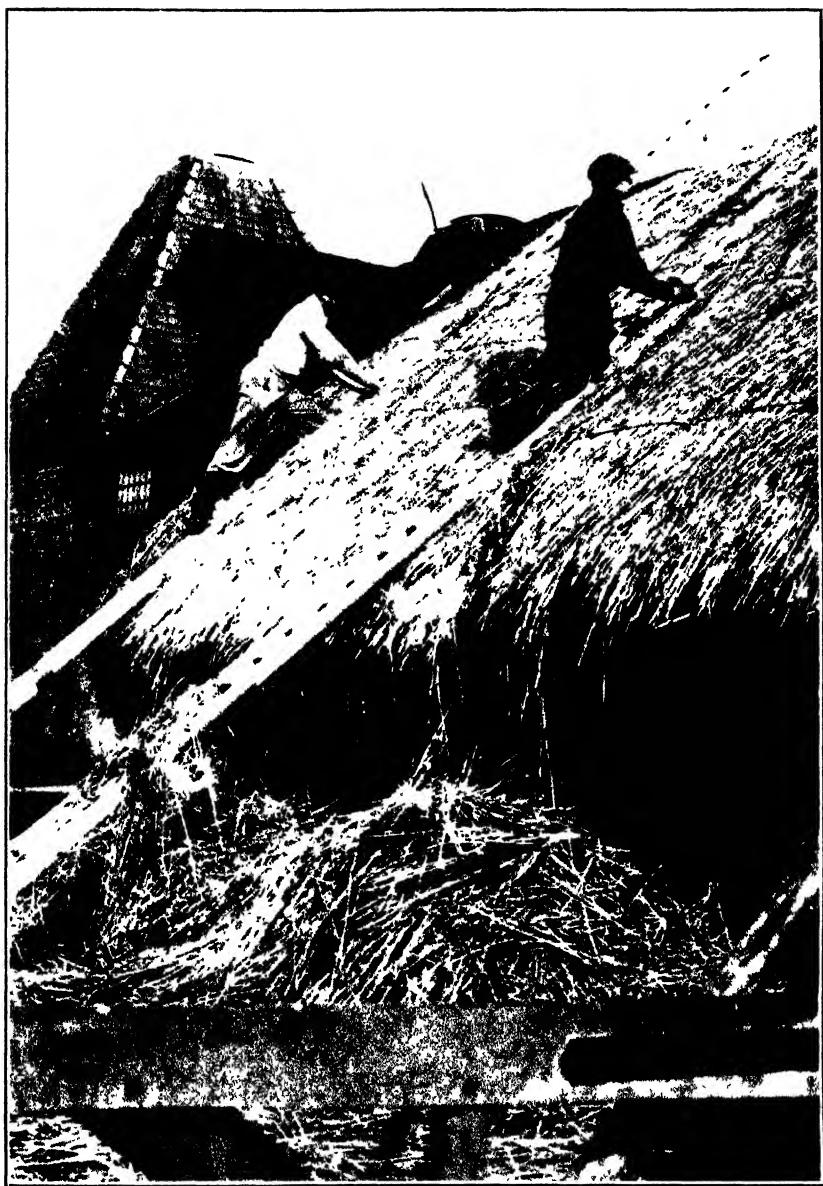
The points for the Cups are awarded on the following basis:—

First prize ..	12 points	Reserve ..	5 points
Second prize ..	9 points	Fifth ..	3 points
Third prize ..	7 points	Sixth ..	1 point

Sixth place points are only scored if there are 10 or more entries. Beside the prize money, award cards are also presented to the successful students. These are highly valued by their recipients, and afterwards are usually found on the walls of the students' cubicles.

In the Agricultural Course, competitors' heats have to be run off beforehand, and, for this, members of the Institute staff usually act as judges. With this exception, outside judges, either farmers, members of the County Advisory Staff or Inspectors of the Ministry of Agriculture are chosen.

On Competition Day, the finals of the Milking Contests are held at 6 a.m. and 3 p.m. and marks are awarded on the scale of points used at the London Dairy Show. Owing to the difficulty of a number of students being in the finals of the manure-sowing and thatching events, and also owing to the uncertainty of the weather, the manure-sowing competition is usually held on some suitable day preceding Competition Day, but, in order to complete the programme, a manure-sowing demonstration is held during the morning, provided



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A Students' Annual Competition Day . two competitors thatching

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The Pruning Competition



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the weather is suitable, by those who are not thatching. Small prizes are given for this, but the awards do not count towards the Challenge Cup. The area of ground allotted to each student for manure-sowing varies, but usually each competitor has to manure $\frac{1}{4}$ acre of ground with superphosphate at the rate of 3 cwt. per acre. Eight students are left in the final of the thatching competition, which is held from 9 a.m.-12 noon, and from 1 p.m.-3.30 p.m.; any competitor who is also in the final of the milking contest, and is, therefore, required to milk in the afternoon, commences thatching an hour earlier.

No preliminary heats are held in the fruit competitions, for which 13 or 14 students usually enter. The spraying contest is held during the morning from 9 a.m.-12 noon. Each competitor has to spray in one of the apple orchards for half an hour, and is judged on speed, thoroughness, and method; and for this purpose lime-sulphur wash is usually employed. The pruning competition takes place from 1 p.m.-3.30 p.m.; last year, each student had to prune eight 12-year-old trees. The trees selected were two Bramleys and two Worcesters (one a vigorous-growing, and the other a weak-growing, variety), and one each of Lane's, Allington, Cox and Newton. To save confusion, as the trees are somewhat separated, each tree is labelled with the competitor's number, and there are several stewards on duty to show the student which is his next tree to prune. Before the competition starts, the students are told that they must not cut out any large branch without informing the steward or judge, and, if consent is not given for this, a coloured label is tied on to the branch to show that the branch would have been cut out if the competitor had used his own discretion. This practice has always worked well; and in the five competitions no tree has been spoilt by over-eagerness of the young competitors. The apple-packing (in boxes) takes place previously to the Competition Day, but the boxes are usually judged while the other competitions are in progress. Each student has to pack two bushel boxes, and, in making the awards, time is also taken into consideration.

For the Poultry Competitions, the plucking is done during the hours of 9.30 a.m.-12 noon. Competitors have to kill and pluck three birds. The trussing is also done at the same time. Two birds have to be trussed for roasting. Although an hour is allowed for each of these competitions, competitors are

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timed, and this is taken into consideration by the judge when he makes his awards. The Poultry-judging Contest is held from 1.15 p.m.-3.30 p.m. Two breeds are selected, and students have to place the four birds of each breed in their order of merit as layers, and afterwards give their reasons for their placings. Nine students competed in the Poultry Competitions last March.

Tea is served at 4 o'clock in a large barn, and half an hour later the prizes are distributed. On the last two occasions, nearly a hundred visitors were present at the distribution of prizes, at which the judges were invited to give their criticisms of the work done during the day. Visitors are always welcome at these competitions, and, in order that they may have no difficulty in finding their way about the farm and buildings, large cards are displayed, directing the way to the various competitions. On arrival at the car park, each visitor is also handed a stencilled programme of the events. Altogether, the Competition Day of the Kent Farm Institute is a very keen and live affair. It is unfortunate that competitions like sheep-shearing cannot be held on the same day, but a competition for this is held later in the season. Students also compete in the Romney Marsh Sheep-Shearing Trials.

In the early days of the Institute, it was found that, although the students were very keen on their lectures, and were anxious to learn any new work on the farm, there was a falling off in keenness in doing the ordinary routine operations of the farm as the courses progressed during the late spring and summer. The Competition Day has very largely solved this difficulty. The problem has also been eased by the Kent Branch of the National Farmers' Union awarding Silver Medals to the best student at practical work during the whole period of his training. These medals are awarded in each of the three courses and are presented by the Chairman of the Kent Branch of the Farmers' Union on the last evening of the summer term. On more than one occasion, a Competition-Day Challenge-Cup Winner has obtained one of these medals.

THE WORKING OF THE SEEDS ACT, 1920, IN THE SEASON 1935-1936

DURING the period under review, the Ministry has again carried through its normal procedure under the Seeds Act, viz., the visiting by Inspectors of seedsmen, merchants, retailers, farmers, etc., all over the country, and the drawing of control samples for check testing at the Official Seed Testing Station, Cambridge. These measures comprise the chief means of oversight of the trade in seeds and the results during the past year indicate that compliance with the Act is, on the whole, fairly good, although it is obviously necessary for the Ministry to maintain its present activities.

At the same time, developments that have been gradually taking shape within the trade over a number of years have necessitated special measures that were not perhaps foreseen in the early days. Reference has been made in previous reports to the gradual change in business methods of the smaller horticultural and agricultural seedsmen. The former, more often than not, now handle mainly pre-packed seeds purchased on a sale-or-return basis from firms of wholesale packeters. They have ceased to be the principals and have become the agents. On the other hand, the agricultural merchant, who at one time had a small trade in agricultural seeds, if he has not given up dealing in seeds entirely, owing to the competition of market agents and representatives of the bigger seed houses, has frequently ceased to carry any stocks at all, and merely books orders that are dispatched direct to the customer from the wholesaler.

These changing conditions have the effect, so far as bulks of seeds are concerned, of reducing the number of separate stocks available for inspection by the Ministry's officials, and of making more difficult the checking of the quality of the supplies that reach the farmer direct from the remote supplier. It has also been apparent during recent seasons that retail sellers of agricultural seeds have been taking delivery of their supplies later in the season than formerly, thus restricting the period during which sampling is possible. In these circumstances, the Ministry has sought to adjust the balance by means of "investigation" samples, i.e., check samples drawn on farmers' premises from parcels of seed as delivered. It may be necessary to increase still further the number of such

THE WORKING OF THE SEEDS ACT: SEASON 1935-36

samples, which give direct information as to the quality of seed and the particulars declared in respect of actual sales to farmers.

The Ministry has also found it necessary to give increasing attention to the practice, referred to in last year's report, of using a price list or catalogue for the purpose of making a statutory declaration. The Act permits this method of declaration, provided that the purchaser is given a statement in writing referring specifically to a printed price list or printed catalogue containing the prescribed particulars. It is obvious, therefore, that in order to comply with the Act, the price list or catalogue must include the necessary particulars of purity, germination, country of origin, or such other details as are required, set out in such a form that the purchaser can relate the written statement which he receives to the entries in the price list or catalogue and thereby ascertain the particulars of the seed with which he has been supplied. Too often, unfortunately, seedsmen, in preparing their catalogues, do not bear this requirement sufficiently in mind, with the result that, especially in respect of mixtures, it is often impossible to identify the entries relating to the seeds that have been supplied to the purchaser. In a number of instances, the Ministry has found it necessary to advise seedsmen as to satisfactory methods of procedure, and seedsmen who adopt the practice of using their seed catalogue as an instrument for compliance with the requirements of the Seeds Act are warned that unless they exercise particular care in the compilation of their price list or catalogue, so that purchasers can identify the particulars relating to seed purchased, they may lay themselves open to the charge of failing to deliver the prescribed particulars on sale of seeds, which is after all the fundamental requirement of the Act.

Visits to Seedsmen. Numerous visits to seedsmen were made by Inspectors during the year.

Apart from the general features in the seed trade to which reference has already been made, it may be said that the expansion of the packet trade has continued, with a marked increase in the number of agents selling packets obtained from well-known houses, and with a reduction in the number of small cards of packeted seeds that were formerly offered by sundriesmen.

The visitation of seedsmen's premises during the year also

THE WORKING OF THE SEEDS ACT: SEASON 1935-36

brought to light instances in which seed described as "clover thirds," "Montgomery seconds," "ribby red clover," "wild white clover cleanings," had been sold without the necessary declaration of particulars of purity, germination, etc. It would appear that some misapprehension may exist among seedsmen as to the inclusion of such types of seed within the scope of the Act. Obviously, however, the provisions of the Seeds Act apply to all seeds included in the Seeds Regulations, 1922, irrespective of grade, and in the case of mixtures of grass and/or clover seeds, when used for agricultural purposes, the prescribed particulars of each of the scheduled seeds should be declared in accordance with Regulation 3 (1) (j) of the Seeds Regulations, 1922.

Farmers and the Act. The number of visits paid to farmers and the number of investigation samples taken on farms, were both more numerous than in the preceding year. The value of these samples has already been indicated; and, in the year under review, they have revealed the fact that, excluding the instances of failure by the seller to make a proper declaration of the statutory particulars, the quality of the seed delivered to farmers has in the main conformed to the particulars declared within the limits of variation permitted by the Act. The most unsatisfactory section of these samples was that of the grass and clover mixtures. In 25 per cent. of these mixture samples no particulars were delivered on sale; and, in another 10 per cent., it was impossible to identify the components in the price lists to which reference was made by the seedsmen. It is, of course, common practice for the farmer to rely upon his seedsman to supply him with a suitable mixture for his particular requirements, but it is regrettable that too often the farmer neglects to require from the seller those elementary safeguards that the Seeds Act was designed to provide.

Sale of Seed Potatoes. No special comment is called for with regard to the oversight of seed potato sellers during the past year.

The chief item of interest as regards seed potatoes was the issue of the Seeds (Amendment) Regulations, 1935. These amending regulations had the effect of adding to the existing classification contained in the Seeds Regulations, 1922, two new classes, viz., Class I (English Special Stock) and Class II

THE WORKING OF THE SEEDS ACT: SEASON 1935-36

(Welsh Special Stock), which are defined as potatoes grown in England and Wales respectively "under the provisions of a scheme authorized by the Minister." So far, two schemes have been authorized by the Minister for the purpose of these Regulations, i.e. those of the Cumberland Seed Potato Growers' Association and the North Wales Certified Seed Potato Growers', Limited.

The Seeds (Amendment) Regulations, 1935, also include an extension of the previous definition of Class 1 (English once grown) so as to bring within its scope such produce of the new "Special Stock" classes as is not eligible to be sold as special stock seed. In all other respects the Seeds Regulations, 1922, remain unaltered.

Private Licensed Seed Testing Stations. Three additional stations have received licences during the year and the number of private licensed stations has reached 81.

It is of interest to note the classification of these stations, viz.—Full licence (i.e., licence to test all seeds specified in Regulation 2 of the Seeds Regulations, 1922), 33; all seeds except grasses, 2; cereal seeds only, 27; various partial licences, 19.

The number of Reserved Portions (duplicate samples of seeds tested by the stations) drawn during the season for check testing at the Official Seed Testing Station was 1,375, comprising 386 clover samples, 107 grasses, 334 cereals, 224 field seeds, 156 pulses, and 168 garden seeds (excluding peas).

A comparison of the results obtained as a result of the tests by the stations and by the Official Seed Testing Station, assists the Ministry to form its conclusions as to the efficiency of the stations, which is a matter of considerable importance in view of the large quantity of seed tested by the stations for the purpose of declarations under the Act in respect of their own purchases and sales. The number of discrepancies this season was 111 or just over 8 per cent. of the total number of samples. Although this is a slight increase over the previous season's percentage, it cannot be regarded as a serious variation. It will be appreciated in this connexion that when, on a check test, the result obtained by the private station is found to be outside the permitted limits of variation, a discrepancy is recorded whether the private station's figure is above or below that of the Official Station, so that the percentage of cases in which a purchaser would have been

THE WORKING OF THE SEEDS ACT: SEASON 1935-36

prejudiced by the result of an inaccurate test at a private licensed station would clearly be much less than 8 per cent.

There have been a few changes in the personnel of the analysts during the year; and, while there has been no marked change in the laboratory arrangements, the equipment of the stations is gradually improving.

On the whole, the work of the private licensed stations is done in an efficient manner; and, in any cases of difficulty, advice and assistance are freely given by the Official Seed Testing Station and by the Ministry's Inspectors.

Control Sampling. The number of samples taken during the season for the purpose of checking the particulars declared on the sale of seeds was 1,432. They comprised 446 grasses and clovers, 118 cereals, 140 field seeds (other than sugar-beet), 363 "loose" garden seeds, 289 packeted seeds and 76 sugar-beet and seed potatoes.

Farm and Garden Seeds. It was found necessary to draw attention to 50 instances of discrepancies in the particulars declared and to 59 incomplete or irregular declarations. Of the 50 discrepancies, 15 were in respect of purity and 35 of germination. Stated as percentages, the figures show that 7·6 per cent. of the total samples called for special attention, 1·1 per cent. in regard to purity and 2·4 per cent. owing to germination discrepancies, while the remaining 4·1 per cent. were cases of omissions from or errors in the declaration.

As regards the purity discrepancies, 4 samples came within 3 per cent. of the declared figure, 3 showed a variation of between 3 and 5 per cent., and 8 exceeded 5 per cent. With regard to the germination discrepancies, 7 samples showed a variation of less than 10 per cent., 12 others varied by less than 15 per cent., leaving 16 in which the difference between the germination declared and that found in the check tests amounted to more than 15 per cent.

Grass and clover seeds, which showed 5 discrepancies in purity and 14 in germination, again occasioned considerable trouble, as is perhaps to be expected in view of their tendency under certain conditions to lose vitality rather quickly. Garden seeds necessitated action in almost the same number of instances, there being 8 purity and 10 germination discrepancies. Cereal seeds showed 1 and field seeds 6 discrepancies in the germination particulars only, while

THE WORKING OF THE SEEDS ACT: SEASON 1935-36

packetted seeds showed 2 discrepancies as to purity and 4 as to germination.

Seed Potatoes. Six instances of misdescription of variety were investigated (5 of which concerned Scottish sellers and were accordingly referred to the Department of Agriculture for Scotland), and 7 instances of false particulars of size and dressing (of which 4 were in regard to Scottish or Irish sellers). There were 8 further cases that concerned the delivery of the statutory statement in that it had either not been given to the purchaser or was incomplete in respect of one or more items. Suitable warnings were issued in respect of these infringements and also in a number of other contraventions of lesser consequence that were reported by Inspectors.

Prosecutions. While there were a number of instances during the season in which a decision concerning the taking of legal proceedings was reached with great difficulty, only one prosecution was actually undertaken. This concerned a firm of seedsmen in East Anglia who, in connexion with a sample of lucerne seed, had made a declaration that was not based on the results of a test made in accordance with the provisions of the Seeds Act. The test had been carried out on the firm's own premises, which are not licensed for testing for the purposes of the Act, and there was therefore an infringement of the Act, which requires that such a test shall be made either at one of the official seed testing stations or at a testing station licensed by the Minister. The defendants pleaded " Guilty " and were fined £1 and costs.

Publications. Copies of the Seeds Act, 1920 (price 2d., post free 2½d.); the Seeds (Amendment) Act, 1925 (price 1d., post free 1½d.); the Seeds Regulations, 1922 (price 3d., post free 3½d.); and the Seeds (Amendment) Regulations, 1935 (price 1d., post free 1½d.), are obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, or through any bookseller.

A convenient summary of the provisions of the Act and Regulations, showing in addition the fees for testing at the Official Station and the size of seed samples to be sent, and also a memorandum on the drawing of samples for testing, may be obtained free of charge on application to the Ministry at 10, Whitehall Place, London, S.W.1.

THE CONTROL OF THE WHITE MOULD DISEASE OF NARCISSUS*

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THE narcissus is subject to a number of diseases that cause premature decay of the foliage. One of the most widespread of these is White Mould, due to the fungus *Ramularia vallisumbrosae* Cav., which occurs year after year in an epidemic form on leaves and flower stalks in districts where warm, moist atmospheric conditions prevail during the spring. The fungus was first discovered in Italy in 1899, but the disease was not recorded in this country until 1906, since when it has appeared in various counties in the north, east and Midlands, as well as in the west. It is, therefore, probably widely distributed throughout the British Isles, but assumes epidemic proportions only in the south-west. In Devon and Cornwall, the disease usually appears in January and spreads during February and March. The foliage on beds of susceptible varieties that have been badly attacked may be completely withered as much as three weeks or a month before the normal time of ripening off. The diseased plant consequently loses the use of the leaves for food manufacture during a considerable part of the season in which the bulb normally stores such food for the development of leaves and flowers in the following year. Measurements of the effect of the premature foliage decay upon the weight and grade of bulbs lifted have not yet been made, but it is believed by growers to result in a poorer crop of flowers in the following year. Direct loss of flower crop may be caused in late varieties, such as Double White, when the disease attacks the flower stalks.

There are considerable differences amongst commercial varieties of narcissus in their susceptibility to White Mould. The varieties most severely affected in the south-west are Golden Spur, Sunrise, *Ornatus maximus*, and Double White.

* The work on which this article is based was carried out under a scheme financed jointly by the Great Western Railway Co. through the Penzance Branch of the National Farmers' Union, and the Ministry of Agriculture and Fisheries upon the recommendation of the Agricultural Research Council, to whom grateful acknowledgments are made.

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On the other hand, King Alfred, Emperor, *Maximus superbus*, Henry Irving, Bath's Flame and *Polyanthus* varieties tend to resist attack, at least until near the end of the growing season.

Description of the Disease. On susceptible varieties the disease may be detected as early as the middle of January. It appears first in the form of small, sunken, greyish streaks, usually situated near the tips of the leaves. The streaks increase in size, and form dark greenish patches on which conspicuous masses of white powdery spores are produced in moist weather (Fig. 1). The area producing spores becomes surrounded by a more or less extensive zone of yellowed tissue where the leaf has been killed. In moist weather, the disease extends down the leaf rapidly, but, under cold, dry conditions, it may be completely held in check. In dry weather, also, the characteristic white spore-masses may be absent and the disease is then easily confused with other leaf troubles. When the leaves are completely withered, the production of the White Mould spores ceases, and, within the leaf, the fungus develops vast numbers of minute, hard, black bodies known as sclerotia. These sclerotia are the form in which the fungus remains alive during the dormant season of the narcissus plant.

The bulbs of affected plants do not become attacked, for the fungus is confined to the portion of the plant growing above the ground and has never been observed on any part of the bulb. This fact probably explains the general observation that newly-planted beds of susceptible varieties are not appreciably attacked during their first year, but that an epidemic may be expected after the first season. Apparently, therefore, the disease is not normally carried on the bulb.

Life History of the Fungus. From February to May, the fungus is distributed from plant to plant by means of cylindrical spores, which are produced in enormous numbers on the White Mould lesions. These spores are carried principally by wind and the splashing of rain drops, and they germinate rapidly in moist weather. They are not very hardy, however, and cannot survive drying for any length of time. During the dormant period of the narcissus bulb in summer, the fungus persists by means of the black sclerotia, which remain in a state of inactivity in withered leaves on the surface of the ground during the summer and

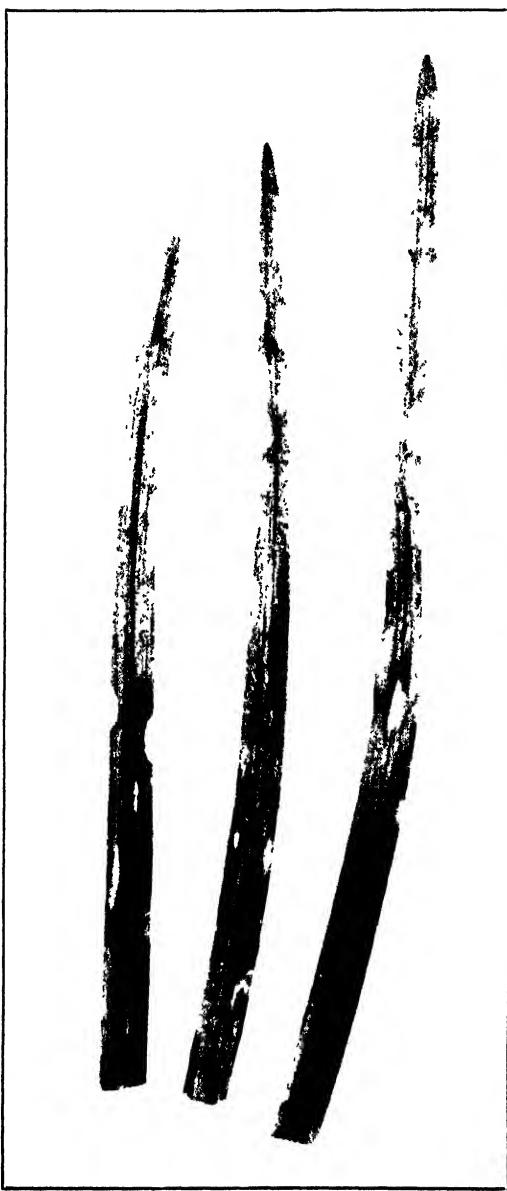


Photo - P. H. Gregory

FIG. 1. White Mould Disease of *Narcissus*.
Showing the appearance of conspicuous masses
of white powdery spores on the leaves.

FIG. 2. Illustrating the control cotton White Woodloss variety Golden Spur by spraying with Bordans Vinton. The right hand field was sprayed twice, and does not show voltage, whereas the opposite side shows the effect of different voltages.



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autumn. Soon after the spear-like shoots of the narcissus appear above ground in winter, the sclerotia germinate. Each sclerotium may produce a crop of thread-like spores* that are capable of infecting the leaves of healthy narcissus plants, and these plants then produce the characteristic masses of White Mould spores that spread the disease rapidly during spring.

Control. Methods at present open to the grower for the control of the disease include attention to general plant hygiene, and spraying and dusting foliage to prevent infection.

General Sanitation. The object to be attained by cultural practice is to prevent the infection of plants in the early stages of growth from spores produced by the sclerotia left in decayed leaves of the previous season. Crop rotation should be practised where possible. There is no evidence at present to suggest that the fungus can contaminate the ground for more than one year, hence a long interval between successive narcissus plantings should not be necessary. If it is necessary to replant narcissi on land that has carried a stock affected with White Mould, a resistant variety such as King Alfred, Bath's Flame or Soleil d'Or should preferably be used. Two susceptible varieties should not be planted close together, as the likelihood of both being heavily infected is thereby increased. Thus, stocks of Golden Spur and Sunrise should be planted as far apart as possible.

The practice of raking over the beds as early as possible, which is so important in checking damage by bulb-fly, will help to remove the infected leaves before they disintegrate and become difficult to handle. Infected foliage should be burnt. In districts where a dry atmosphere prevails, epidemics can probably be prevented, except in abnormal seasons, by removing and burning the leaves. It is certain, however, that in the south-west of England, removing and burning the withered leaves from infected beds is not an adequate control of the disease, for, even when this is scrupulously carried out, the disease will reappear in the following year. When it is considered that one square inch of withered leaf may carry upwards of ten thousand sclerotia of the fungus, the impossibility of eliminating infection

* It is intended to publish elsewhere a scientific account of the germination of the sclerotium, which has been fully investigated.

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completely by merely raking over the beds becomes apparent. General hygienic measures should be adopted to delay the onset of the disease, but, to control it satisfactorily, spraying will usually prove necessary.

Recommendations for Spraying. Spraying experiments that have been carried out in various parts of the early-flower districts of Cornwall and the Isles of Scilly have shown that White Mould can be controlled satisfactorily by the application of Bordeaux Mixture, and it is now possible to make certain recommendations to growers who desire to control the disease.

Bordeaux Mixture should be prepared according to the following formula :

Copper sulphate (bluestone)	4 lb.
Hydrated lime (slaked lime)	3 lb.
Water	40 gal.

The hydrated lime must be of the highest quality, fresh, and in the form of a fine powder. It can be obtained in paper-lined bags. The copper sulphate should be dissolved in 30 gal. of water in a wooden vessel, and a wetting agent added to this solution as recommended below. The lime should be stirred slowly into the remaining 10 gal. of water in a separate vessel and then added slowly, with constant stirring, to the copper-sulphate solution. A blue gelatinous precipitate will be formed and the mixture must be used within a few hours.

The waxy surface of the narcissus leaf is difficult to cover with spray fluid, but this obstacle can be overcome by adding suitable wetting agents to the spray. A number of the new proprietary wetters now on the market have proved adequate for the purpose. The amount of wetting agent needed depends on a number of factors, including composition of spray, hardness of water, nature of foliage to be sprayed, etc. To obtain an adequate cover of narcissus foliage, it is usually necessary to employ a somewhat higher concentration of the wetter than that recommended by the manufacturers for spraying plants with less waxy foliage.

Spraying machines of the pneumatic, knapsack or wheelbarrow type have proved satisfactory, but it is essential in applying the spray that a pressure of not less than 50 lb. per sq. in. be maintained. The spray is best applied from a fine nozzle, and it is most convenient to have two nozzles at the

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end of a lance, so arranged that they throw the spray more or less horizontally in opposite directions. This arrangement has the advantage of spraying both sides of the vertically placed narcissus leaf at one operation. The quantity of spray required for an efficient cover is about 200 gal. per acre for each application.

Experience in both 1935 and 1936 has emphasized the need for an early application of spray to control White Mould. Considerable variation in the date for the first application evidently exists, even between farms in the same locality, but, generally speaking, it should be made when the shoots are from 3 to 6 in. high. The need for subsequent applications will depend on local conditions and rainfall, but, in the experiments already carried out, one or two further applications of spray at monthly intervals have proved satisfactory. Spraying should be done during weather that will give the deposit time to dry thoroughly before it is exposed to rain. When it is once dry, Bordeaux Mixture adheres excellently. Fig. 2 illustrates control of White Mould on beds of narcissus Golden Spur, photographed on May 13, 1935. The right-hand bed was sprayed with Bordeaux Mixture twice, and has retained green foliage, while the unsprayed leaves on the left-hand bed are all dead.

It should be noted that a certain amount of spray damage may sometimes appear on narcissus foliage after the application of copper fungicides. This usually takes the form of purplish-brown spots or sunken white or brown areas on the leaves. With well-made Bordeaux Mixture, damage of this kind is usually negligible, but it may be increased if poor quality lime is used.

In districts where the difficulties of obtaining water are too great to permit of wet spraying, the use of a copper-lime dust is worthy of trial. So far, the control of White Mould obtained with copper-lime dusts has not been so good as that following wet sprays, and a greater number of applications will probably be necessary.

LICENSING OF STALLIONS UNDER THE HORSE BREEDING ACT, 1918

THE following table shows the number of stallions licensed under the Horse Breeding Act, 1918, in each year since 1930:—

	Service Season						
	1930	1931	1932	1933	1934	1935	1936
Shires	752	761	853	888	962	1,074	1,188
Other heavy horses	335	342	358	387	471	542	587
Light horses (Including ponies)	343	329	266	241	254	277	275
	1,430	1,432	1,477	1,516	1,687	1,893	2,050

The number of stallions licensed in England and Wales again shows an increase and is the highest recorded since 1924. In 1936, 2,050 licences were issued as compared with 1,893 in 1935 and 1,687 in 1934. The number has risen during the past five years by 618, an increase of 43 per cent.

NUMBER OF APPLICATIONS FOR LICENCES NOT GRANTED AND GROUNDS FOR REFUSAL, 1936

Breed	Number refused	Percentage refused	Disease								
			Whistling	Roaring	Sidebone	Cataract	Shivering	Ringbone	Bone Spavin	Defective Genital Organs	Poor Physique and Conformation
PEDIGREE.											
Clydesdale ..	7	4·1	—	2(b)	3	1(a)	1	—	—	—	—
Percheron ..	2	2·1	—	1	1	—	—	—	—	—	—
Shire ..	35	3·3	9(a)	5	7	3	—	5	1(b)	—	—
Suffolk ..	4	1·8	1	—	1	—	1	1(a)	—	—	—
Thoroughbred ..	5	3·0	1	2	—	—	—	—	—	—	—
Polo Pony ..	1	12·5	—	—	—	—	—	—	1	—	—
NON-PEDIGREE											
Light ..	1	5·5	—	—	—	—	—	—	—	5	—
Heavy ..	19	6·4	2	2	6	1(c)	—	—	—	1	7
TOTALS ..	74	3·5	13	12	18	6	2	6	1	2	13

(a) One also affected with sidebone.

(b) " " " whistling.

(c) Also affected with roaring.

LICENSING OF STALLIONS

Heavy stallions were wholly responsible for the increase during the year under review, and numerically this was mainly attributable to the number of Shires licensed, which showed an increase of 114 (or 11 per cent.) as compared with the 1935 figure. Percherons show the largest relative increase, rising from 80 in 1935 to 99 in 1936 (24 per cent.); minor increases were shown by Suffolks, which rose from 210 in 1935 to 226 in 1936 (8 per cent.), and Clydesdales from 184 to 191 (4 per cent.). The number of licences issued in respect of light breeds (including ponies and cobs) was practically unchanged, 275 in 1936 as against 277 in 1935.

Licences were refused in respect of 74 stallions, as compared with 52 in 1935. The increase of 22 is mainly due to the number refused as being affected with whistling (13 in 1936 as compared with 5 in 1935) and for defective physique and conformation (13 in 1936 to 2 in 1935). Appeals against refusals numbered 13, a decrease of 1 on the previous year's figure, and 8 were successful as compared with 9 in 1935. The breeds of the rejected stallions and the reasons for rejections are set out in the table on page 870.

Forty-seven infringements of the Act were reported to the Ministry during the season, a similar number to that reported in 1935. In two instances, proceedings were taken by the police in respect of unlicensed stallions that were being travelled for service, and in both of them convictions were recorded.

Most of the other infringements reported were in respect of stallions, though licensed, being travelled for service, or exhibited on premises not in the occupation of the owner, with a view to their use for service, unaccompanied by their licences, and in these instances the owners and leaders were warned by the Ministry or police as to the requirements of the Act in this respect.

Stallion owners in possession of licences for the year ended October 31, 1936, are reminded that these licences expired on that date, and should be returned to the Ministry. Application for licences for the 1937 travelling season may now be made, and it will greatly assist the Ministry to make economical arrangements for the examination of stallions, if applications are made as early as possible. Application forms may be obtained from the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1.

LICENSING OF STALLIONS

**NUMBER OF APPLICATIONS FOR LICENCES AND NUMBER OF LICENCES GRANTED AND REFUSED IN ENGLAND AND WALES,
1935-36**

Breed or Type	PEDIGREE (i.e., stallions entered or accepted for entry in the recognized Stud Book of their breed)			NON-PEDIGREE (i.e., stallions not entered or accepted for entry in a recognized Stud Book)			Totals of each breed or type (pedigree and non-pedigree)		
	Applications	Licensed	Refused	Applications	Licensed	Refused	Applications	Licensed	Refused
HEAVY.									
Clydesdale .. .	172	165	7	27	26	1	199	191	8
Percheron .. .	96	94	2	6	5	1	102	99	3
Shire .. .	1,053	1,018	35	182	170	12	1,235	1,188	47
Suffolk .. .	225	221	4	6	5	1	231	226	5
Others .. .	—	—	—	75	71	4	75	71	4
LIGHT.									
Arab .. .	8	8	—	2	2	—	10	10	—
Cleveland Bay .. .	3	3	—	—	—	—	3	3	—
Hackney .. .	9	9	—	5	5	—	14	14	—
Hunter .. .	1	1	—	7	6	1	8	7	1
Thoroughbred .. .	165	160	5	4	4	—	169	164	5
PONY AND COB.									
Dales .. .	9	9	1	7	7	—	16	16	—
Fell .. .	5	5	—	1	1	—	6	6	1
Highland .. .	1	1	—	—	—	—	1	1	—
Polo and Riding .. .	8	7	1	1	1	—	9	8	1
Shetland .. .	7	7	—	—	—	—	7	7	—
Welsh .. .	8	8	—	1	1	—	9	9	—
Welsh Cob .. .	15	15	—	15	15	—	30	30	—
TOTALS .. .	1,785	1,731	54	339	319	20	2,124	2,050	74

MARKETING NOTES

Milk Marketing Scheme. Pool prices and rates of producer-retailers' contributions for October, 1936, are given below, with comparative figures for September, 1936, and October, 1935. In October, 1936, the wholesale liquid milk price was 1s. 5d. per gal., an increase of 2d. per gal. on the previous month's price, but the same as in October, 1935.

Region	Pool Prices			Producer-Retailers' Contributions		
	Oct. 1936	Sept. 1936	Oct. 1935	Oct. 1936	Sept. 1936	Oct. 1935
	d.	d.	d.	d.	d.	d.
Northern	13	11½	13½	3 16	3 16
North-Western	13	11½	13½	3 16	3 16
Eastern	13½	12	13½	3 16	2 16
East Midland	13	11½	13½	3 16	3 16
West Midland	12½	11½	13	3 16	3 16
North Wales	12½	11½	13½	3 16	3 16
South Wales	12½	11½	13½	3 16	3 16
Southern	13½	12	13½	3 16	2 16
Mid-Western	12½	11½	13	3 16	3 16
Far-Western	12½	11½	13	3 16	3 16
South-Eastern	13½	12½	14	3 16	2 16
Unweighted Average	12·91	11·64	13·43	3·63	3·18

These prices and rates of contribution do not make allowance for any premiums for special services and level deliveries, or for the accredited premium.

The number of producers who qualified for the accredited premium was 18,930, and the sum required for the payment of the premium was equivalent to a levy of 349d. per gal. on pool sales.

The inter-regional compensation levy was fixed at 2½d. per gal. on liquid-milk sales, as compared with 2d. per gal. in October, 1935. A levy of ¼d. per gal. was made for general expenses.

Sales on wholesale contracts were as follows:—

		Oct., 1936		Oct., 1935	
		(estimated)			
		Gal.	Gal.	Gal.	Gal.
Liquid ..	..	..	..	47,654,469	47,267,205
Manufacturing ..	..	..	..	25,325,116	21,290,207
				<hr/>	<hr/>
		72,979,585		68,557,412	

Percentage liquid sales 65·30

68·95

Percentage manufacturing sales 34·70

31·05

MARKETING NOTES

The average realization price of manufacturing milk during October was 5·766d. per gal. compared with 6·14d. per gal. for October, 1935. The quantity of milk manufactured into cheese on farms was 1,836,381 gal. compared with 2,148,191 gal. in September and 1,400,136 gal. in October, 1935.

Pigs and Bacon Marketing Schemes : Bacon Pig Contract for 1937. Consequent upon the failure of the Pigs and Bacon Marketing Boards to reach agreement upon all the terms of the 1937 contract, the Boards requested the Minister to appoint an independent person to decide the matters in dispute. The Minister accordingly nominated Sir Robert B. Greig, LL.D., D.Sc., whose decision was announced on October 29. The contract that has been prescribed by the Pigs Marketing Board embodies Sir Robert Greig's findings. For 1937, there will be three types of contract:

- (i) A direct contract between producer and curer;
- (ii) A dead-weight contract with the Pigs Marketing Board; and
- (iii) A live-weight contract with the Board.

Pigs on Board contracts will be resold to curers, their allocation amongst curers to be on a basis to be agreed between the two Boards. The last date for the receipt by the Board of contracts was fixed as November 30, 1936, direct, and for Board contracts, December 7, 1936.

The following is a summary of the principal terms and conditions of the *direct contract*:-

Prices. The average annual price payable for a basic pig, which will be a Grade B pig in Class I, is to be 12s. per score. This price is to be varied monthly as follows:-

	s. d.		s. d.		s. d.
January ..	12 3	May ..	12 0	September ..	11 6
February ..	12 6	June ..	11 9	October ..	11 6
March ..	12 9	July ..	11 6	November ..	11 9
April ..	12 6	August ..	11 6	December ..	12 6

These monthly basic prices will be increased by 1d. per score for each complete 3d. by which the ascertained cost of the standard feeding stuffs ration exceeds 7s. 6d. per cwt. up to a maximum feeding cost of 9s. per cwt., and 1d. per score will be deducted for each complete 3d. by which the feed prices falls below 7s. 6d. per cwt.

If the number of pigs contracted for on January 1, 1937 (or such later date as may be agreed between the Boards), reaches a total of 2,400,000, the basic price is to be increased by 2d. per score.

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The basic price will not vary with bacon or offal prices.

In addition, when live pigs are carried by rail, there is payable, at the option of the curer, a further sum of 1s. per pig when the distance, station to station, is over 50 miles up to 100 miles, 2s. per pig when the distance is over 100 miles up to 175 miles, and 3s. per pig for greater distances.

Classes and Grades. A new schedule of classes and grades, and of consequent additions to or deductions from the basic price, is adopted. The weight classes are to be:—

Class I.—7 score to 8 score 7 lb. dead-weight.

Class II.—8 score 8 lb. to 9 score dead-weight.

Class III.—9 score 1 lb. to 10 score 10 lb. dead-weight.

Class IV.—Over 10 score 10 lb. dead-weight.

There will be three main grades, A, B, & C, by reference to new back and belly measurements and either a shoulder or a loin measurement, and in addition Grades F, L, & DB, for pigs which fail in the scheduled measurements.

Delivery. The bonus scheme and the requirement that at least 25 per cent. of the number contracted for must be delivered in the first four months of the year have been discontinued; but the number of pigs contracted to be delivered in the last four months is again to be not more than 45 per cent. of the total contracted for over the 12 months.

Tolerance is permitted only to the extent that, subject to certain conditions as to payment, pigs may be delivered one month earlier or later than the month of contract.

Transport and Insurance. Flat-rate transport arrangements similar to those operating in 1936 have again been made with the Railway Companies, but the minimum load for road transport by the Companies is reduced to 8 pigs made up in not more than four collections.

The curer is again free to insure against loss through damage to pigs during transit or by disease, or he may carry these risks himself, and for this purpose 6d. per pig is to be deducted by the curer from the price payable.

Defaults. Provision is again made for a producer or a curer to be freed from his liability under the contract in cases of involuntary default such as outbreaks of disease; for other defaults the producer is to pay £1 per pig (12s. 6d. to the Board, 7s. 6d. to the curer).

General. The contract may be terminated by the Bacon Marketing Board if the total number of pigs secured on contracts is less than 2,200,000. If either that Board or the

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Pigs Marketing Board determine that the prices payable under the contract are uneconomic, and failing agreement on alternative terms within seven days, the matter is to be referred to an independent person, who may settle terms on which the contract shall be continued. Provision is also made for the termination of the contract in certain circumstances if the present system of regulation of imports of bacon is discontinued or modified or a levy subsidy scheme affecting pigs and bacon is brought into operation.

Board Contracts. All Board contracts must be made through a District Agent of the Board, who will be responsible for the supervision of the performance of the contract. For this service, producers will pay 1s. per pig to the Board. Curers will pay the Board 2s. per pig as a commission for obtaining pigs on Board contracts; and they will also pay a sum of 2s. 3d. per pig on all rail-borne pigs irrespective of the distance travelled.

The *dead-weight* Board contract is similar in all essentials to the direct contract, subject to the variations mentioned in the preceding paragraph; the pigs will be sold to curers on sub-sale contracts and producers will receive payment (including the 2s. 3d. per pig in respect of transit) through the Board.

The *live-weight* Board contract is a new form of contract and is designed to meet the need of small producers and others who prefer payment on the basis of the live-weight ascertained at the point of despatch. The pigs will be weighed and despatched by rail from collecting centres. There are only two weight-classes under this contract; 208 to 240 lb. live-weight and 230 to 275 lb. live-weight. Pigs under 208 lb. and over 275 lb. will be rejected at the collecting centre. Payment will be made on the live-weight ascertained at the collecting centre and on the grading of the carcass at the factory. The live-weight price per score for a grade B pig will be 8s. 8d. when the dead-weight price per score of a basic pig is 12s.; Grade A pigs will receive a bonus of 4d. per score live-weight, and there will be appropriate deductions for lower-grade pigs. The additional sum of 2s. 3d. per pig in respect of rail-borne pigs, to be paid by the curer, will be retained by the Pigs Board and will be available to meet any losses that may occur in reselling these pigs to curers on a dead-weight basis.

Bacon-Pig Prices for November, 1936. The contract price

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of the basic pig (Class I, Grade C) for November, 1936, was 12s. 2d. per score compared with 12s. for October. The cost of the feeding stuffs ration was 8s. 9d. per cwt. compared with 8s. 5½d. for the previous month, while the ascertained price of bacon fell from 97s. 7d. per cwt. to 93s. 5d. The realization value of offals rose from 8s. 5d. to 8s. 8d. per pig.

Potato Marketing Scheme. At the third annual general meeting of registered producers, on October 29, 1936, the three retiring Special Members, Messrs. J. E. W. Beeston, J. T. Fitzpatrick and A. Graham were re-elected. Meetings for the election of district members were held on October 17 in the East Midland, Northern, Scotland, West Midland and Wales districts. In the East Midland district, a vacancy was caused by the resignation of a member. In the Scotland district, one of the retiring members was defeated; and, in the Northern district, all four retiring members were returned. In the other two districts, the retiring members were returned unopposed. Mr. W. Gavin, C.B.E., has again been co-opted a member of the Board.

Census of Stocks. A census of stocks on hand with registered producers and authorized merchants at midnight on November 7 has been taken by the Board. A similar census was taken last year.

Sale of "Seconds" Potatoes. The Potato Marketing Board have announced that, as from November 1, registered producers, on making application to the Board, will be granted permission to sell "seconds" for human consumption. "Seconds" are defined as sound, marketable potatoes that have passed through a riddle of 1½ in. and stand on a riddle of 1¼ in. No "seconds" may be marketed unless special labels, to be obtained by the Board, are attached to the bags or other containers used.

Hops Marketing Scheme. An advance of £5 per pocket of sound 1936 quota hops has been made by the Board to growers who have completed their deliveries into approved warehouses. The Board propose to make a further payment to growers as soon as possible after the valuation of the crop has been completed. The quantity of hops sent to the Board reached a total of 148,678 pockets, and the weight is expected to reach the estimated market demand of 225,000 cwt. The quality of the crop is reported to be well up to the average.

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Reports on Schemes under Agricultural Marketing Acts.

A Report on Agricultural Marketing Schemes for the year 1935 (Cmnd. 5284) has recently been issued by the Ministry and the Scottish Office. The Report describes the operation of the eight schemes in force in Great Britain during that year, and also the steps taken in connexion with other schemes submitted to the Minister but not in force. A large quantity of statistical material regarding the schemes is made generally available for the first time, and the accounts of the Boards are printed as an appendix to the Report by arrangements with the Boards concerned. The Report shows that the acreage under hops, sales of bacon pigs and the production of bacon, and sales of milk, all increased during the year.

A separate report on Development Schemes (Cmnd. 5285) contains an account of the operation of the Bacon Development Scheme. The Board's powers in relation to the licensing of bacon factories are described, and it is stated that in 1935 licences were granted to 579 curers, covering 3,058 premises in which bacon was produced during the six months ended May 17, 1935. A few licences were also granted in respect of new premises or new parts of existing premises.

Both reports may be obtained from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, or through any bookseller. The price of the Report on Marketing Schemes is 2s., post free 2s. 2d., and of the Report on Development Schemes, 2d., post free 2½d.

Cattle Fund. The following table gives particulars of payments made under the Cattle Industry (Emergency Provisions) Acts, 1934 to 1936, and shows the numbers of animals marked on importation into Great Britain:—

	1936 April 1 to Oct. 31	1935 April 1 to Oct. 31	Sept. 1, 1934* to Oct. 31, 1936
Payments	£2,269,261	£2,194,880	£8,166,617
Animals in respect of which payments were made ..	976,563	929,982	3,453,621
Average payment per animal	£2 6 5½	£2 7 2	£2 7 3
Imported animals marked at ports (Great Britain only)	327,751	237,695	†1,076,596

* Commencement of subsidy payments.

† As from August 6, 1934.

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Regulation of Imports of Meat, July-September, 1936.

The following statement shows imports of meat from foreign countries in July-September, 1936, compared with the allocations; and imports from Empire countries, of beef and veal and frozen pork in the third quarter compared with the agreed maxima for the second half of the year, and of mutton and lamb in the first nine months of the year compared with the agreed maximum for the year as a whole:—

	Empire Countries 'ooo cwt.		Foreign Countries 'ooo cwt.	
	Agreed maxima July-Dec.	Imports July-Sept.	Allocations July-Sept.	Imports July-Sept.
Chilled Beef ..			1,988	2,007
Frozen Beef and Veal ..	2,134	1,081	260	192
Frozen Mutton and Lamb ..	Jan.-Dec. 5,650	Jan.-Sept. 4,032	263	253
Chilled or Frozen Pork	July-Dec. 288*	July-Sept. 69	96	68

Supplies and Prices of Early Potatoes in 1936: Home Supplies. The area under early potatoes (both first and second earlies) in Great Britain showed a further reduction in 1936 and amounted to 103,769 acres as against 112,186 acres in 1935 and 125,359 acres in 1934 (according to the Potato Marketing Board's returns of holdings of one acre or more). No estimates of the yield of early potatoes are available, but there is evidence that, in spite of the decrease in acreage, the 1936 crop was above the average and considerably greater than that of the previous season. The home crop as a whole reached the market at an earlier date than in 1935, but marketing was very irregular as lifting was frequently interrupted by rain. Supplies often exceeded requirements, however, with a depressing effect on prices, and the market was further congested by the overlapping of first earlies by second earlies and also by immature maincrop potatoes.

Imported Supplies. Imports of early potatoes from the Irish Free State and foreign countries were regulated under

* Includes one-half of the allocations for baconer carcasses to Australia and New Zealand for the year 1936.

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the Potato (Import Regulation) Order, 1934, as in the previous season. The arrangements made under the Order are intended not only to limit imports to the needs of the market, but also to regulate the period of marketing so that the markets shall not be overloaded when home-produced and Channel Islands supplies become available. With this object in view it is provided that the bulk of licensed imports must be brought in before the end of May. The quota for February-May, 1936, was originally fixed at 72,000 tons, but it was subsequently increased to 90,000 tons in prospect of a shortage of maincrop supplies at the end of the season. Imports in the three months June, July and August were limited to 18,000 tons, the bulk of this quantity being allotted to the month of June. Total imports under licence during the whole season amounted to 104,500 tons as compared with 90,400 tons in 1935.

Imports from the Channel Islands, which form the bulk of the unregulated supplies, were considerably smaller than in 1935 owing to unfavourable weather conditions which both retarded and lessened the crop. This decline in Channel Islands supplies more than offset the increase in imports from the Irish Free State and foreign countries, and there was a net decrease of some 6 per cent. in total imports.

Imports from all sources in 1934, 1935 and 1936 were as follows:—

		1934 tons	1935 tons	1936 tons
Irish Free State and Foreign Countries ..	..	77,250	90,400	104,500
Channel Islands .. .. ..	..	65,150	85,300	60,200
Other Empire Countries .. .. ..	..	1,500	1,300	1,700
TOTAL		143,900	177,000	166,400

The Channel Islands, and Spain and the Canary Islands were again the chief sources of imported supplies. The Channel Islands' share of our total imports, however, fell from 45 per cent. in 1934 and 48 per cent. in 1935, to 36 per cent. in 1936, whereas the proportion supplied by Spain and the Canaries rose from 46 per cent. in 1934 and 45 per cent. in 1935, to 59 per cent. in the past season.

Prices. Prices of Spanish and Canary Islands potatoes at the beginning of the season were similar to those ruling in 1935, but later they tended to fall somewhat below the 1935

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level. The small Jersey crop as a whole fetched considerably higher prices than in the previous year, but the arrival on the market of home-produced supplies in the latter part of June caused a sharp general decline. Prices of home-grown earlies throughout the season were lower than in 1935. The following table shows the seasonal average wholesale prices per hundredweight of first and second quality new potatoes at large town markets in the past three seasons:—

Variety		1934		1935		1936*	
		s.	d.	s.	d.	s.	d.
Jersey (average price in June)	..	14	3	19	3	21	3
Spanish	..	18	6	20	3	19	0
English :							
Duke of York	..	9	0	8	3	7	6
Epicure	..	7	0	6	3	5	9
Sharpe's Express	..	8	6	9	0	6	9

* Provisional figures.

Regulation of Imports of Processed Milks. Imports of processed milks in July-September, 1936, together with the allocations made to foreign exporting countries and the Irish Free State and imports from other Empire countries in the corresponding months of the two previous years are shown in the following table:—

Source	Condensed	Condensed	Milk	Cream
	Skinned Milk	Whole Milk	Powder	
	'ooo cwt.	'ooo cwt.	'ooo cwt.	'ooo cwt.
Foreign Countries :				
Allocations ..	305	82	30	10
Imports ..	349	50	6	11
Irish Free State :				
Allocations ..	21	5	—	25*
Imports ..	23	6	—	14
Other Empire Countries :				
Imports—				
July-Sept., 1934 ..	—	55	18	—
,, 1935 ..	—	39	22	—
,, 1936 ..	—	42	18	—

* Allocation for the six months, July to December, 1936.

NOTE.—Excess imports of condensed skimmed milk from foreign countries are due to the carry forward of deficiencies from previous periods.

Milk Acts, 1934 and 1936 : Manufacturing Milk. Advances

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made by the Ministry up to November 15, 1936, in respect of manufacturing milk were as follows:—

Section of Act		Period of Manufacture	Gallons	Amount
	(a) <i>Milk Marketing Board for England and Wales.</i>			£
1	In respect of milk : Manufactured at factories other than the Board's	April, 1934, to July, 1936	460,655,507	2,137,278
2	Manufactured by the Board ..	April, 1934, to Sept., 1935	2,573,662	12,850
3	Made into cheese on farms ..	April, 1934, to June, 1936	36,055,516	187,463
	* Total for England and Wales ..		499,284,685	2,337,591
	(b) <i>Government of Northern Ireland.</i>			
6	In respect of milk : Manufactured into cream and butter at registered creameries ..	April, 1934, to Aug., 1936	57,209,282	351,868
		TOTAL ..	556,493,967	2,689,459

* Owing to the Cheese-Milk Prices for August and September, 1936, being in excess of the Standard Price, no subsidy is payable in respect of milk produced and manufactured in these months.

Milk-in-Schools Scheme. Exchequer contributions up to November 15, 1936, towards the expenses of the Milk Marketing Board for England and Wales in respect of the supply of 42,437,312 gal. of milk to school-children at reduced rates during the months October, 1934, to August, 1936, amounted to £777,751. From October, 1935, to August, 1936, 19,585,870 gal. of milk were consumed as compared with 20,867,541 gal. in the corresponding months of the first year of the Scheme. Further returns will slightly increase the figures for the second year.

Cheese-Milk Price. For the purpose of payments under the Milk Acts, 1934 and 1936 (whether by the Exchequer to Milk Marketing Boards or by Boards to the Exchequer), in respect of milk used for manufacture, the cheese-milk price has been certified by the Minister and the Secretary of State for Scotland to be 5·93 pence per lb. for the month of November, 1936.

Wheat Act, 1932 : Sales of Home-grown Wheat, Cereal Year, 1936-7. Certificates lodged with the Wheat Com-

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mission by registered growers during the period August 1 to November 6, 1936, cover sales of 6,317,636 cwt. of millable wheat as compared with 11,961,973 cwt. in the corresponding period (to November 8) in the last cereal year.

Deficiency Payments. The Wheat Commission have announced that they have decided not to make during the present autumn an advance payment to registered wheat growers on account of deficiency payments for the cereal year 1936-37. During the past four years, the Commission have, under power given them by the Wheat Act, 1932, and the Wheat Byelaws, generally made payments on account in November and December and at certain dates later in the cereal year. The decision not to make payments this autumn is due to the present level of wheat prices.

New Quota Payments Order. The Minister, in pursuance of the powers conferred upon him by the Wheat Act, 1932, and on the recommendation of the Wheat Commission, has made the Wheat (Quota Payments) No. 3 Order, 1936 (Statutory Rules and Orders, 1936, No. 1149), prescribing that the amount of the quota payment which every miller and every importer of flour shall be liable to make to the Wheat Commission in respect of deliveries of flour during the period commencing November 1, 1936, shall be 4·8 pence per cwt. (equivalent to 1s. per sack of 280 lb.). This Order supersedes the Wheat (Quota Payments) No. 2 Order, 1936, under which the quota payment has been 9·6 pence per cwt. (2s. per sack of 280 lb.) since August 9, 1936. The new rate is the lowest since the Wheat Act came into force.

Sugar-Beet : Contracts for the Purchase of the 1937 Crop. The Sugar Commission issued the following statement on November 10:—

Section 5 (1) of the Sugar Industry (Reorganization) Act, 1936, requires the British Sugar Corporation Ltd. (a company formed by the amalgamation of all the companies previously engaged in the manufacture of sugar from home-grown beet) to enter into contracts for the purchase of sugar-beet upon terms and conditions agreed between the Corporation and the representatives of sugar-beet growers, or where agreement is not reached, upon such terms and conditions as may be determined by the Sugar Commission.

In accordance with this procedure, the Commission has made an Order determining the terms and conditions of the contracts for the purchase of sugar-beet of the 1937 crop delivered to English factories. The Order fixes prices for beet delivered at the factories named, as in the table on p. 884. (The corresponding prices for 1936 are shown in brackets.)

As in 1936, the prices quoted relate to beet properly topped and washed, having a sugar content of 15½ per cent., and are subject to an addition or deduction of 3d. per ton in respect of each 0·1 per cent. by which the sugar content is greater or less than 15½ per cent.

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Factory	Beet Price per ton		
	1937		(1936)
	s.	d.	s. d.
Cantley	36	0	
King's Lynn	36	0	
Wissington	36	0	
Bardney	36	6	
Bury St. Edmunds	36	6	
Ely	36	6	
Felstead	36	6	
Ipswich	36	6	
Peterborough	36	6	
Spalding	36	6	
Colwick	37	0	
Kelham	37	0	
Allscott	37	6	
Brigg	37	6	
Kidderminster	37	6	
Poppleton	37	6	
Selby	37	6	

Special claims were made by growers in areas distant from any factory to be relieved of some part of their freight charges. It appears to the Commission that this question is closely linked up with the questions of factory siting and capacity, on which further investigation is required. Pending the result of those inquiries, and without prejudice to future policy in this respect, the Commission has decided that for the 1937 season the Corporation shall defray railway freight charges in excess of 7s. per ton on all sugar-beet accepted by the Corporation for delivery to the factories at Allscott and Kidderminster.

In other respects the conditions of the contracts for 1937 will be identical with those for 1936, with the exception that the preferential price for pulp sold by the Corporation to growers is fixed at £4 15s. per ton gross. After allowing for the usual rebates the net prices to the growers will be £4 5s. per ton for pulp delivered in October, 1937; £4 7s. 6d. in November, 1937, and £4 10s. in December, 1937.

The Commission's Order does not deal with the terms of the contracts for beet consigned to the Scottish factory at Cupar, which are the subject of separate negotiations between the Corporation and the growers' representatives.

The Corporation and representatives of growers for the Cupar factory have subsequently, after consultation with the Commission, agreed that the price for beet of the 1937 crop for that factory shall be 35s. 6d. per ton f.o.r. (compared with a corresponding price of 34s. per ton for 1936), subject to the proviso that the Corporation does not accept liability for railway freight charges in excess of 10s. per ton. Pulp prices will be the same as for the English factories.

Production of Home-Grown Beet Sugar during 1936-37 Campaign. According to information furnished by the British Sugar Corporation, Ltd., the total quantities of beet sugar manufactured in Great Britain during October, 1936, and the corresponding month in 1935, were:—

	White cwt.	Raw cwt.	Total cwt.
1936 1,422,223	1,159,698	2,581,921	
1935 1,236,244	1,616,723	2,852,967	

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The total quantities of sugar produced to the end of October in each of the two manufacturing campaigns were:—

	<i>White cwt.</i>	<i>Raw cwt.</i>	<i>Total cwt.</i>
Campaign, 1936-37	1,422,223	1,159,698	2,581,921
" 1935-36	1,315,712	1,666,771	2,982,483

National Mark Lists of Authorized Packers and Approved Retailers. The Ministry has compiled and issued lists of authorized packers of National Mark commodities. The lists include packers of eggs, dressed poultry, cheese, creamery butter, wheat flour, wheat flakes, malt products, canned and bottled fruit and vegetables, cider, perry, fruit juices, honey and jam. These lists are given in Marketing Leaflet 57B. The authorized packers and registered wholesale distributors of fresh fruit and vegetables are given in Marketing Leaflet 57A.

National Mark commodities are now found in most high-class shops throughout the country. With the object of securing a greater measure of support from the retail trade, and the most effective use of National Mark publicity, the Ministry has issued a preliminary list of retailers who have applied for enrolment as approved distributors of National Mark produce and who have undertaken to co-operate with the Department in maintaining the quality standards at the point of retail sale. This list (Marketing Leaflet 62), which includes retail distributors of most of the commodities included in Marketing Leaflet 57B, has been drawn up with the assistance of the National Federation of Grocers' and Provision Dealers' Associations and the Parliamentary Committee of the Co-operative Congress.

A roll of retail distributors of National Mark beef is already in existence, and the Retail Fruit Trade Federation is at present considering the possibilities of establishing an approved list for the fruit and vegetables trade.

The National Mark is the Registered Certification Trade Mark of the Minister and differs from commercial brands in that the use of the Mark implies conformity with legal standards of quality (which are available to all to consult) and impartial supervision of quality by the Department.

Canned Fruit and Vegetables. The substantial clearance of stocks of canned fresh fruits and vegetables during the winter of 1935 and the spring of 1936 encouraged a revival

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of activity in English canneries. In 1936, supplies of the various raw fruits were, with a few exceptions, much in excess of those available in 1935, whilst, despite a reduced rate of yield, the larger acreage of peas grown under contract in 1936 for canning purposes enabled canners to increase their output of canned fresh-picked peas.

Wet weather during the soft-fruit and pea seasons hampered a steady flow of supplies. Difficulty was experienced in handling the large crops of plums, owing to the rapidity with which each variety matured as a result of a warm spell of weather at the end of August. Critical examination of the various fruit packs shows, however, that, despite these drawbacks, National Mark canned fruit and vegetables this year, are well up to the usual high standard.

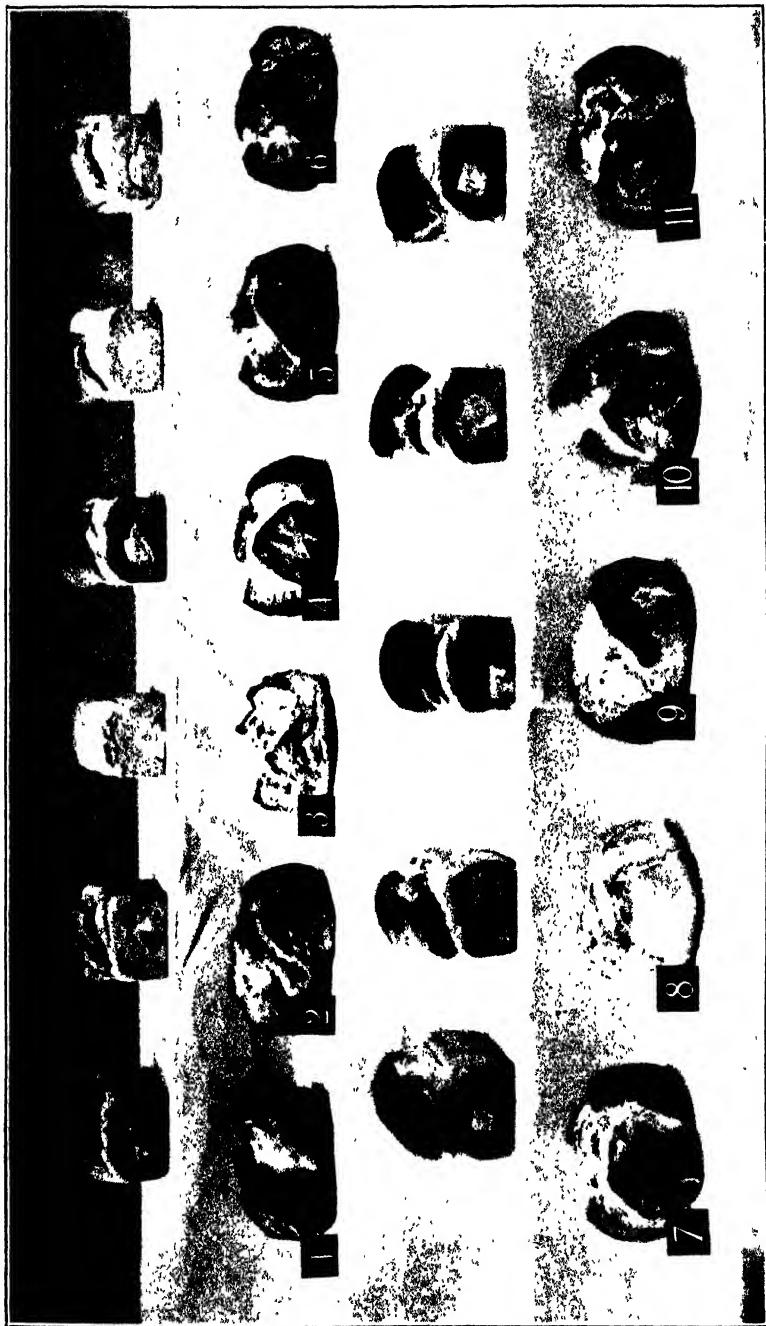
Further, the packs, although larger than in previous years, are being disposed of more rapidly through distributive channels, a number of canners having already sold their entire stocks of certain packs.

The number of authorized canners working under the Scheme is now 36, and the number of factories 46. The larger canners are strengthening their sales organizations, and the extension of the canning campaign by the packing of non-seasonal products, such as processed-dried peas and fruit salads, has helped to reduce overhead costs. These factors are helping to put the English canning-industry, which is already an important outlet for English fresh fruits and vegetables, on a sounder basis and make it capable of absorbing increased quantities of home-grown produce.

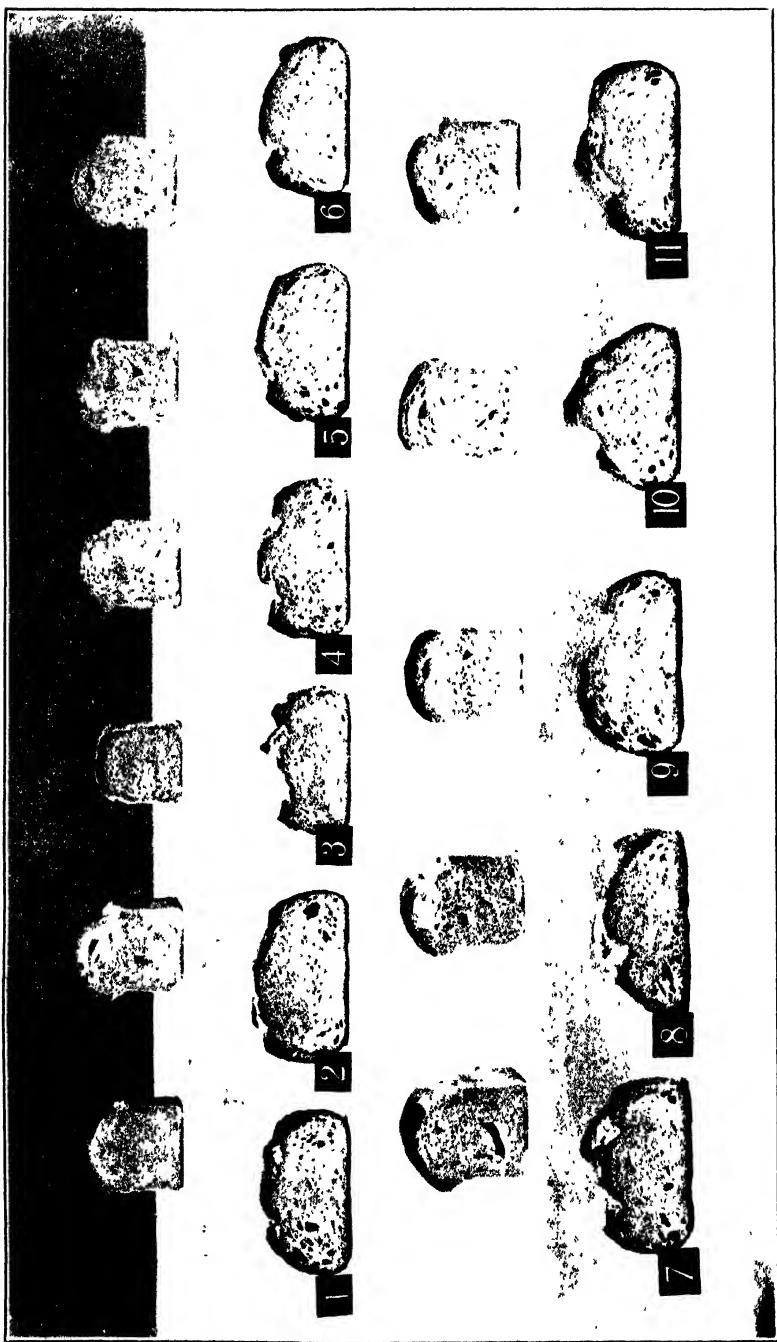
Cheese. By arrangement with the show authorities concerned, the exhibits of cheese entered by authorized National Mark packers in open classes at the following four shows this year were graded by the graders officially appointed under the National Mark Caerphilly and Lancashire cheese schemes:

<i>Shows</i>		<i>Awards</i>
Highbridge Show	..	First, second and third in the open class (for Caerphilly cheese). First and second in the rennet class (for Caerphilly cheese).
Royal Lancashire Show	..	First, second and third (for Lancashire cheese).
Goosnagh and District Show	..	First and third (for Lancashire cheese).
Garstang and District Show	..	First, second and third (for Lancashire cheese).

Bread-making Tests carried out at the National Bakery School, with samples of National Mark VII English (Woolam) straight flour milled in an 1936 crop wheat harvested before the end of August. The Test loaf is meant



To face page 886.



Bread-making Tests, carried out at the National Bakery School with samples of National Mark All-English (Yeastman) Straight-flour milled from the 1939 crop when harvested before the end of August. The Test loaves cut

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At the London Dairy Show in October, authorized packers of National Mark cheese were successful in obtaining the first, second, third and reserve awards for Wensleydale cheese, and the first, second and third awards for Stilton cheese.

Home-grown Wheat Flour for Bread-making. The National Bakery School has conducted bread-making tests with 11 samples of National Mark All-English (Yeoman) Straights flour, milled from 1936 crop wheat harvested before the end of August. The flour was supplied by millers in different parts of the country, and, with one exception, satisfactory bread was produced from the samples tested. Photographs of the test loaves are shown on the accompanying inset. The following are the main observations taken from the Director's report:—

1. Most of the flours possessed a good colour and produced bread with a good creamish colour; the greater uniformity of crumb colour was most marked this year.
2. All the flours produced stable doughs with the equivalent of $1\frac{1}{4}$ gallons of water per sack. During fermentation all the doughs gassed well and the majority of them possessed good stability.
3. Following the practice of previous years, the process employed was of $2\frac{1}{2}$ -hour dough time. With one exception, good bread was obtained in all cases. The total length of the bread-making process was approximately $4\frac{1}{2}$ hours from start to finish.
4. As will be seen from the illustrations, all the flours with one exception produced bread of good volume, particularly producing bold oven bottom loaves.
5. Flour of the quality of the samples examined would be quite suitable for blending with stronger flour in the bakery.

Copies of Marketing Leaflet 12E, giving the recipe for using National Mark flour in commercial bread-making, may be obtained from the Ministry free of charge.

Spread of the National Mark Movement: Union of South Africa.—The Government of the Union of South Africa has notified its intention of introducing a national mark scheme in respect of meat, eggs, oranges, grape fruit, potatoes, onions, grapes, pears, peaches and apples offered for sale. A start is to be made on the Johannesburg market.

The scheme is voluntary and is similar to that in this country, three or four grades being prescribed by statute for each kind of produce.

The grade marks and the national-mark labels are applied by producers, in the same way as in this country, but the Johannesburg scheme differs somewhat in that all the produce is inspected before sale by Government inspectors. Produce that is not up to the standard indicated by the grade mark on the package may be marked down to a lower grade (or entirely rejected) by the inspector.

DECEMBER ON THE FARM

E. J. ROBERTS, M.A., M.Sc.

To the younger generation, December is primarily the month in which Christmas comes and is associated with holidays and some degree of festivity. The extent to which townsmen can completely abandon the normal activities and take a real holiday arouses even more envious feelings in the minds of the farm staff than difference in pay and hours. On 366 days this year, cows will have had to be milked and other stock will have had to receive varying degrees of attention. On a large farm, a system of weekly holidays can be arranged, but the average British farm is comparatively small, and it is very difficult to arrange for holidays. The most that can be done is to suspend working in the fields, and only to deal with what is necessary for the well-being of the live stock. One can only express the hope that some day the profits from farming may be such as to allow of the employment of an additional handyman, one of whose functions would be to relieve the other workers in turn for weekly and annual holidays.

Meanwhile, it is some consolation to reflect that, although conditions of farm workers compare unfavourably in this respect with town workers, they are, at any rate, much better than formerly. A colleague relates how he entered into conversation with an old man on a walk across the Yorkshire Wolds a few years ago. He had gone out to his first "place" when 12 years old, at a wage of £2 10s. od. a year, living in. He had one day's holiday a year to attend the Martinmas Fair in the nearest market town. The second year, he took a day's holiday during the year to visit his mother, who was ill, and as a result his one holiday was stopped. All this was stated without any feeling of resentment: "Mr. —— was a good master and I stopped with him five years. He was a rare good farmer, too, and we all had to work hard."

The last remark leads one to consider the factors that make for a contented staff, and the opinion may be hazarded that one of the most important is that the farmer must really know his job, and plan out work in a methodical way. Nothing tends to make a good man more disgruntled than the feeling that his labour and skill are not being effectively and fully utilized. The long evenings give opportunities for planning

DECEMBER ON THE FARM

and deciding on policy for the coming season, as well as for arranging details of all the odd jobs that ought to be dealt with in the dead of winter when bad weather or frost restricts activities in the field.

As usual, wiseacres have predicted a hard winter. They are bound to be right some time. Except to the arable farmer with heavy clay land, a mild winter is so welcome that when their prophecies go wrong they are forgiven or forgotten. In any event, it is well to remember what the makers of Christmas cards forget—that hard weather rarely sets in until after the New Year. The severe and prolonged frost of 1929, for instance, did not begin until nearly the middle of February.

By the end of the year, ploughing should be well advanced, and a considerable area ready to benefit by any frosts that do occur.

Beef. Losses or no losses, December is the beef man's month. In addition to the more important exhibitions of fat stock at the London Smithfield, Birmingham, Norwich, York and Edinburgh, there is an "annual prize sale of fat stock" at practically every auction mart. Great interest is shown in the championship competitions at these local sales, and cheap transport has encouraged many enthusiastic feeders to send exhibits far afield. To attempt to discuss the utility of such competitions would only reveal a lack of understanding of such occasions, and failure to realize that there is more in farming than making money and producing efficiently.

The rather high prices for store cattle, coupled with the high-price level for all feeding stuffs, cause the feeder to think anxiously of the future. A few feeders of the older generation, exchanging reminiscences the other day, expressed the opinion that, although the modern feeder does not value farmyard manure as much as his predecessors did, he was actually forced to pay more for it, because of feeding losses. The feeders in question recalled the old custom whereby many Lincolnshire and Norfolk feeders were supplied with cattle, cotton and linseed cakes, by Northamptonshire men. The feeders delivered up the cattle in the spring, when they would be ready for the pastures in Northamptonshire. The feeders thus got their straw made into manure for the cost of tending the cattle, and without any capital outlay; the graziers got stores purchased at low autumn-prices, cheaply wintered, and in just the right condition in spring for going

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right ahead on the pasture. They were thus able to take full advantage of the early grass and be ready for sale in July before prices dropped.

The question of quality in relation to carcasses is one much discussed at this time of year; those who are able to visit the Carcass Competition of the Smithfield Club have a splendid opportunity of examining carcasses that have been put in order of merit by the judges. A recently issued leaflet of the Ministry of Agriculture and Fisheries, Marketing Leaflet No. 75, entitled "Fat Stock (August, 1936)" can be recommended, not only to those who are interested in the sale of fat stock on a dead-weight and quality basis, but to all feeders. A scheme is described for selling from farms to wholesale meat-markets under forward quotations, based on carcass-grade and weight; during 1935, the number of cattle sold under this scheme amounted to 10,573, sheep to 27,669 and pigs to 7,262. The various classes and grades are defined and well illustrated by photographs. There is also a list of centres from which quotations may be obtained, and also the arrangements made for insurance under the scheme.

In Aberdeenshire, noted for the quality of its fat cattle, the diet consists mostly of fresh oat-straw, threshed once a week or even every morning, a liberal quantity of swedes, and concentrates; 4 parts of bruised oats and one of linseed cake is a popular mixture of concentrates. Though the quality of Aberdeenshire beef is generally associated with the breeding of the animals, the large quantities of swedes and turnips used are claimed by many to have much to do with it. In the East of Scotland, larger allowances of succulents are used, and a 9-cwt. bullock may get up to $1\frac{1}{2}$ cwt. of turnips.

As regards rate of fattening, Mr. Raynes, who has a large experience of experimental work in this branch of farming, considers that it is more economical to feed steers to put on 2 lb. than $2\frac{1}{2}$ lb. a day. It is probable that steers differ in this respect, and that a few would repay feeding up to $2\frac{1}{2}$ lb. or even 3 lb. a day, just as some cows will repay high feeding. Individual attention would be essential for that. To revert to Aberdeenshire, it has been suggested that the system of tying up the cattle, though it has the disadvantage of a higher labour cost, develops a type of cattleman who takes an individual interest in his animals, and who can feed the good-doers accordingly.

In discussing the fattening of cattle, one is rather apt to

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overlook the fact that such a large proportion of home-fed beef comes from fat cows. Those fattened off in winter generally get the same fare as the rest of the dairy herd. Owing to the low price of cow beef, those that do not fatten readily are sold for "what they will make."

The use of roots in any great quantity for dairy cows is often hotly disputed, with the usual result of leaving the respective supporters of opposed views more convinced than ever of their soundness. As assisting the side that, in these days, appears to be having the worse of the argument, a colleague mentioned recently that the most impressive results, both by way of milk records and financial returns he had seen for a long time, were those of a large milk-producer in the East of Scotland, who gives his cows practically unlimited swedes—probably about a cwt. a day, and an average of only 6 lb. of concentrates.

Folded Sheep. Lambing begins in many flocks this month. At the time of writing, both the autumn weather and the trend of prices promise well for the coming lamb-crop. To look further ahead, one may add that it is not without misgiving that one observes the interest shown abroad in English breeds suitable for fat-lamb production. The recent visit of a British expert to South America to judge carcasses pleases us in one respect, but is a sign that one may expect the "fight" to stiffen before long.

In selecting concentrates for the flock, manurial values receive due consideration. Recent experiments suggest that foods that are not so rich in nitrogen may often give results that are better than what is anticipated.

Thus, in the recently issued Rothamsted Annual Report for 1935 (Rothamsted Experimental Station, Harpenden, 2s. 6d.), an experiment is described in which the manurial value of foods fed to sheep is measured in terms of crop increase. The trial was carried out at Woburn, where the soil is light. Twelve tons per acre of the swede crop were fed off by sheep. One lot received, in addition to the swedes, a mixture of linseed and cotton cakes at the rate of 15 cwt. per acre, supplying 78 lb. of nitrogen; the other lot received the same weight of a mixture of oats, wheat and barley, supplying 26 lb. of nitrogen. Barley (Plumage Archer) was drilled early in March, and the yields of grain and straw from the crop were determined. After cake feeding, the yield was 38·7 bus., while, after the cereal mixture, the yield of grain

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was 32·5. In the report it is stated that the higher yield after the cake mixture is in accordance with previous results, but that it was remarkable that the corn plot, which received only 26 lb. nitrogen in the four years' rotation, should give so good a result, and one so nearly approaching that from the higher application.

Grass Land. The winter months are suitable for work on grass land, and enable the pasture to be put into a productive condition in time for the next grazing season. The type of tillage operation needed depends on the state of the surface. If no more is needed than tearing up the mat, the grass harrows sold for the purpose, or a weighted set of sharp-tooth-harrows, enable this to be done efficiently. It is advisable to graze well before operations are carried out on grass land. If deeper cultivation is necessary, in order to get at the root system of the herbage, implements like the Wilder Pitchpole harrow, or Bamfords' self-cleaning harrow, give excellent results. In some districts, as in parts of Herefordshire, it is possible to get land cultivated in both directions with the Wilder for 6s. per acre. The Bamford is a more recent implement. It is designed to work in one of three depths, and its action is such that, when the tines are raised for passing through the grid for cleaning, another set enters the ground; in this way, no part of the ground is left untilled. If there is much rubbish, it is advisable to collect it with a horse rake, or it may damage the turf.

The benefit from such deep-pasture cultivation follows, not only from the breaking up of the mat, but also from the effect on the rooting system. The roots are induced to send up a number of vegetative buds and tillers, instead of the flowering stems, which are of less value in the formation of a good pasture; it may be mentioned, incidentally, that one of the factors responsible for the high value of indigenous grasses is their propensity for forming vegetative tillers rather than flowering stalks. It is often advisable to follow pasture cultivation by a renovating mixture of grass and clover seeds, particularly where there is but little perennial ryegrass and wild white clover. Although the end of March is generally considered the most suitable time for sowing such mixtures, good results may follow such work in December; an instance of the beneficial results of sowing wild white clover in December is given in the *Scottish Journal of Agriculture* for

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October, 1935. There is nothing to be gained by including a large number of species in renovating mixtures. Wild white clover and perennial ryegrass may be used, with the possible addition of rough- and smooth-stalked meadowgrass, timothy and cocksfoot.

The pasture is in a suitable condition for manuring after grazing bare and cultivating the surface. Should there be a possibility that lime is required, the Advisory Agricultural chemist should be consulted. Should some form of basic slag be decided upon, this should be applied as early as possible in the winter. Experiments carried out from Rothamsted, under the ægis of the Ministry of Agriculture Basic Slag Committee, show the superiority of high-soluble basic slag over other forms, although the low-soluble slag and mineral phosphate both have value in certain conditions; in the counties, it has generally been considered that the latter gives good returns in districts of adequate rainfall. It appears, from the 1935 Rothamsted Report, that the investigations have already had the useful result of increasing the proportion of agriculturally effective slags; thus, in 1934-35 the percentage of total deliveries of slag represented by the high-soluble type (80 per cent. or more) amounted to 72·4 per cent., as against 51·8 per cent. in the year 1924-25.

December Harvest : Reeds. There is a revival of interest in thatching because of the demand for thatched roofs for many modern houses. It is doubtful whether it is a sincere form of art to build in one century according to the style of another; in walking through an old Wiltshire or Devon village, one can, however, see that, since building must be done, there is much to be said for building in harmony with the existing dwellings.

Reeds for thatching are collected in December, by which time frost should have taken off the leaves; cutting is continued until the end of March or early April, when the young shoots appear. It should, perhaps, be mentioned that in some parts, as in Somerset, the term "reeds" when applied to thatching means unthrashed straw, the ears from which have been cut off for thrashing separately, and the leaf blades and sheaths stripped off. Large quantities of reeds are harvested from the Norfolk Broads and the sides of the waters of Suffolk; Mr. Farman, the well-known Norfolk reed-thatcher, considers that the reed thatch probably originated in East Anglia.

NOTES ON MANURING

F. HANLEY, M.A.,

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Liming. When studying reports of agricultural surveys, the reader cannot but be struck by the frequency with which lime deficiency is mentioned as a serious trouble in the area surveyed. Despite the futility of attempting to grow many of the common agricultural and horticultural crops on lime-deficient soils, there is much evidence pointing to soil acidity as still being one of the major factors limiting the productivity of large areas of land in this country. The subject has received so much attention and publicity in the past that further reference to it might be considered to be, and indeed should be, unnecessary. Surely every farmer and landowner must be familiar with the troubles that arise from lime-deficiency, at least from hearsay if not from bitter experience. If this is so, however, then there are surprisingly many farmers who, whilst suffering serious loss from its incidence, have failed to take adequate steps to control the trouble.

In reports of two further surveys that have appeared this year, soil acidity is again shown to be a serious handicap to the farmers of the areas surveyed. One of these surveys, carried out by the Department of Agricultural Economics at the Midland Agricultural College, relates to sand land farming in the Sherwood Forest area of Nottinghamshire. The author of the report refers to the depression in this sand land farming and states that the basis of the improvement of these sand land farms ought to be liming. The following extract is taken from the summary of the report. "At present it is the visible dilapidations that have first claim upon the depleted estate revenues, and the prospective tenant looking for a cheap farm is not over-critical. But very often the most serious dilapidation, the chief underlying cause of the farm poverty, is lime-deficiency, a deficiency not likely to be removed by the type of tenant attracted to a cheap farm, so that the very re-letting often saddles both landlord and tenant with an unprofitable contract."

The second survey was carried out by the Agricultural Organizer for East Suffolk, and covers an area in the south-east of that county. In connexion with this survey a large

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number of soil samples were examined at Cambridge in respect of their lime status, and, in discussing the data collected, the Organizer states that, out of a total area of 16,821 acres classed in the Ministry's returns as being under crops and grass, 7,091 acres (i.e. approximately 42 per cent.) were lacking in lime. This figure includes 1,237 acres (7 per cent.), so seriously lime-deficient that sugar-beet and barley would fail completely in most seasons, and a further 2,549 acres (15 per cent.) on which serious reduction in yield would occur even if complete failure were avoided.

Admittedly these surveys relate to only two districts, but much evidence of a similar nature has been published on previous occasions, and inquiry in many Advisory Provinces will elicit the information that soil acidity is still a common cause of crop failure. At a time when the possibilities of reclaiming or improving land are frequently under discussion, it seems remarkable that more cannot be done to bring back into full productivity those lands that are known to require little more initial expenditure than the cost of a dressing of lime or chalk. The extension of the sugar-beet industry has served to awaken interest in the matter in some parts of the country, but it is no exaggeration to say that every year the yield of sugar on hundreds of acres of land is seriously reduced by soil acidity.

Despite this fact—and there are, of course, corresponding reductions in the yield and quality of other crops such as barley, legumes and brassicæ—large quantities of waste lime are still available at many beet-sugar factories. Indeed, the disposal of this waste material is said to be a serious problem for some factories. Is it beyond the ingenuity of the factory and the farmer to secure the dispatch of much more of this lime-sludge to the land that is so badly in need of it? It may be that, to do this economically, the material will eventually have to be dried, but though it is often very wet during the winter and spring, it is dry enough during the summer to be worth while carting within a limited radius of the factory. From 2 to 2½ tons of this sludge, usually to be had for no more than the cost of carting, contains as much calcium carbonate as 1 ton of ground carbonate of lime.

It is not every district that has a beet factory within easy reach, and, unless the sludge can be dried to a fairly low moisture content, it will obviously not be economic to transport it over long distances. There are, however, very few

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districts in this country that have no source of lime within reasonable distance, whether it be chalk, limestone or waste lime. During the last year or two there has been some indication of increased efforts to remedy lime-deficiency, but much remains to be done. Not only is the productivity of the land involved, but also, now that the importance of calcium and other mineral elements in the feeding of live stock is generally recognized, the nutritional value of the produce must not be lost sight of, a point of particular importance in the case of grass land.

To wait until the effect of soil acidity is visible to the naked eye in the form of partial crop failures is obviously unsound, for by that time considerable loss of crop must have been suffered. Sound advice on the liming of land can now be obtained from the County or Provincial Advisory Staffs, and this is one direction in which soil analysis, properly carried out, can be trusted to give reliable results, though "rapid methods for use in the field" are still not to be relied upon when it comes to the question of *how much* lime to apply. This is a point where old ideas may require to be modified in the light of recent discoveries. The decision as to how much lime to apply to a field is not one to be made lightly, for too small a dose may be sheer waste of money if it is insufficient to reduce the acidity to the level at which crops can thrive, whilst if too much is used the remedy itself may prove harmful, for there is evidence that diseases such as grey-speck in oats and heart- or dry-rot in sugar-beet may be caused by deficiencies of the so-called minor elements of plant food such as manganese and boron, brought about by excessive soil alkalinity converting the supplies of these elements in the soil into a form in which they are unavailable to crop plants.

It would obviously be unwise, in the present state of our knowledge, to attach too much importance to the possible harmful effects of over-liming, but, looking at the matter from another angle, direct evidence that doses of lime largely in excess of the actual need of the soil are not always the most economic, is contained in the results of the long-term experiments at Woburn. In a recent account of these experiments it is shown that the rate of loss of lime from the soil is greater when heavy doses are applied than when smaller ones are used. The wisest policy in the long run is to remedy any serious existing lime-deficiency by giving the

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appropriate dressing, based on soil analysis carried out at some reliable laboratory, and to guard against future deficiency by including a small application of lime in the manuring policy of the farm—whether it be grass or arable. Such a scheme has the additional advantages that it maintains the land at a constant level of productivity as far as the lime factor is concerned, and, by making the cost of liming an annual charge, does away with sudden calls for heavy expenditure—which are so liable to upset the farm budget.

Wherever liming is to be done for next season's crop the sooner it is carried out the better. In recent years, especially during dry summers, the writer has come across many instances in which lime applied in February and March had little or no effect on the crop grown in that season, patchiness and stunted growth being almost as prevalent on the limed areas as on control strips left unlimed. Yet the period January to March often produces more inquiries as to the advisability of liming land for that season's crop than any other three months in the year. The need for lime is best judged before the previous crop is harvested—the adviser has then the maximum evidence on which to base his advice and the farmer can get the lime on in time for the next crop to derive substantial benefit.

Manuring for Tomatoes. Growers of glasshouse crops are not alone in their leaning towards phosphatic fertilizers. In the past, market gardeners have used heavy dressings for outdoor vegetable crops, and many vegetable growers still insist on the need for these heavy applications. With tomatoes, however, there is now definite experimental evidence that bonemeal or bone flour at the rate of $\frac{1}{2}$ ton per acre need not be used in the base fertilizer more than once in two or even three years, irrespective of whether the soil has been steamed or not. Potash is probably the most important constituent of any base fertilizer. Not only does adequate potash make for good, healthy growth, but it often helps to counter such troubles as blotchy ripening. Sulphate of potash, at the rate of $\frac{1}{2}$ ton per acre is preferable to other forms of potash in view of the susceptibility of tomatoes to injury from chlorides. The nitrogen in the base fertilizer should be in a slowly available form such as $\frac{1}{2}$ ton per acre of hoof and horn. Nitrogen can often be omitted, however, on new land, and it

NOTES ON MANURING

is usually unnecessary, and may even be harmful, on newly-steamed soil.

It is in the type and frequency of the dressings after planting, however, that the tomato grower can show his real skill in the art of manuring. The composition, and time of application, of these dressings are largely governed by climatic conditions and the growth of the crop. The apparent similarity in the effects of sunshine and potash on the growth of the tomato plant, must be constantly borne in mind. In sunless periods, and during the early part of the growing season, dressings should include a high proportion of potash. Caution is necessary, however, later in the season, and when climatic conditions change, for excess of potash may then prove detrimental to the size and quality of the fruit.

On the other hand, though very little nitrogenous fertilizer is required in the first dressing after planting, which may often consist solely of sulphate of potash at about 5 cwt. per acre, nitrogen should usually be the chief constituent in later dressings.

The inclusion of phosphate in top dressings is by no means universal, but in view of the recently established connexion between the phosphate and potash content of the tomato plant it seems undesirable to omit phosphate altogether, especially in seasons when it is not included in the base fertilizer.

Water Supply for Glasshouses. Reference was made in an earlier paragraph to the harmful effects of chlorides on the growth of tomato plants. The presence of salt or sodium chloride in the water used for glasshouse crops is not infrequently a cause of serious trouble in districts near the sea coast, e.g., round the Wash. Not only has the presence of chloride a harmful effect on the growth of the tomato plants, but the reaction between the salt and the soil may result, in time, in a serious deterioration in the physical condition of the soil. In view of the frequent occurrence of this trouble in some districts, it is important that growers should realize that no treatment is yet known by which the salt content of brackish water can be reduced to harmless proportions. The only safe course is to be sure, when selecting a site for a glasshouse, that a suitable supply of water is available—unless a site has some special value that will compensate for any disadvantages of the water supply.

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That the tomato plant will readily take up chloride is shown by the following analyses of the "ash" of tomato plants growing on the same holding in houses situated only a short distance apart. House No. 1 was served by a well supplying water containing very little sodium chloride, and house No. 2 by a well supplying water with a much higher salt content.

	<i>House No. 1</i>	<i>House No. 2</i>
	%	%
Cl in water (calculated as sodium chloride) ..	0·004	0·041
Cl in "ash" of leaf stalk, midrib and main veins	8·86	22·54
Cl in "ash" of remainder of leaf tissue ..	3·02	13·13

The salty water mentioned in the above table is by no means an extreme case, for other samples examined, from houses where tomatoes have not been progressing satisfactorily have sometimes shown a chloride content equivalent to over 1 per cent. sodium chloride.

PRICES OF ARTIFICIAL MANURES

Description.	Average prices per ton (2,240 lb.) during week ended Nov. 11th.					Cost per Unit ¶
	Bristol	Hull	L'pool	London		
Nitrate of Soda (N. 15½%) ..	£ s. 7 12d	£ s. 7 12d	£ s. 7 12d	£ s. 7 12d	s. d. 9 10	
" " Granulated (N. 16%) ..	7 12d	7 12d	7 12d	7 12d	9 6	
Nitrate of Lime (N. 13%) ..	7 od	7 od	7 od	7 od	10 9	
Nitro-Chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4	
Sulphate of Ammonia :—						
Neutral (N. 20·6%) ..	6 19d	6 19d	6 19d	6 19d	6 9	
Calcium Cyanamide (N. 20·6%)	6 19e	6 19e	6 19e	6 19e	6 9	
Kainite (Pot. 14%) ..	2 18	2 15	2 15	2 15	3 11	
Potash Salts (Pot. 30%) ..	5 0	4 17	4 15	4 17	3 3	
" " (Pot. 20%) ..	3 15	3 12	3 12	3 12	3 7	
Muriate of Potash (Pot. 50%) ..	8 3	8 1	7 17	8 1	3 3	
Sulphate " (Pot. 48%) ..	9 15	9 13	9 9	9 13	4 0	
Basic Slag (P.A. 15½%) ..	2 10c	2 0c	..	2 6c	2 11	
" " (P.A. 14%) ..	2 6c	1 16c	1 16c	2 3c	3 1	
Grd. Rock Phosphate (P.A. 26— 27½%) ..	2 10a	2 5a	2 10a	2 5a	1 8	
Superphosphate (S.P.A. 16%) ..	2 19	..	2 19f	2 16g	3 6	
" " (S.P.A. 13½%) ..	2 15	2 13	2 15f	2 12g	3 10	
Bone Meal (N. 34% P.A. 20½%) ..	..	6 10	6 5h	6 10	..	
Steamed Bone Flour (N. 4%) ..						
P.A. 27½—29½%) ..	5 12	5 10	5 0h	5 0	..	

Abbreviations . . . N. = Nitrogen ; P.A. = Phosphoric Acid ;

S.P.A. = Soluble Phosphoric Acid ; Pot = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station unless otherwise stated. Unit values are calculated on carriage-paid prices.

§ Prices are for not less than 2-ton lots, nett cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. prices.

a Prices for 4-ton lots f.o.r. Fineness 85 per cent. through standard sieve.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater, at Hull and Liverpool, f.o.r. neighbouring works, and at London, f.o.r. depots in London district. Fineness 80 per cent. through standard sieve

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra; for lots of 2 tons and under 4 tons, 5s. per ton extra; and for lots of 1 ton and under 2 tons, 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons, the price is 5s. per ton extra; for lots of 1 ton and under 2 tons, 10s. per ton extra; for lots of 10 cwt. and under 1 ton, 15s. extra; and for lots of less than 10 cwt. but not less than 2 cwt., 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails; southern rails, 1s. 3d. extra.

h Prices shown are f.o.r. Appley Bridge.

¶ These are calculated by regarding a ton as comprising 100 "units" (equal parts of 22.4 lb.) so that a fertilizer, for example, with 16 per cent. nitrogen, contains 16 such "units" in a ton. Then, if the price per ton of such a fertilizer be divided by the percentage figure, the deduced cost is that of a "unit" of that agent. Those in the table above are based on London prices. (For further explanation, see Advisory Leaflet No. 146, "The Valuation of Artificial Manures," obtainable from the Ministry, free of charge.)

NOTES ON FEEDING

CHARLES CROWTHER, M.A., PH.D.,

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Protein Requirements of the Pig. The general conditions that govern protein requirement and the possibilities of protein storage in the animal body were discussed recently in these notes (July, 1936, p. 389). In dealing with the pig, tentative standards for the optimum protein requirements were given, with the implication that little or no further improvement in either growth-rate or ratio of lean to fat could be expected by raising the protein supply beyond these levels. It was indicated that these standards would be met by rations containing digestible protein ranging from about 17 per cent. for the 30-lb. weaner down to about 10 per cent. for the 210-lb. baconer. These conclusions are now substantially confirmed by experimental work at Cambridge and in Scotland, on which reports have been issued during the past month.

The Cambridge report (*Jour. Agric. Sci.*, Vol. XXVI, Oct., 1936, pp. 546-619) is of particular interest since it represents the most precise and comprehensive investigation of the subject ever carried out in this country. It furnishes also an impressive example of the great wealth of data of interest that can be derived from feeding experimental work when the nutrition expert, statistician and meat specialist join forces for the investigation.

In this work, carried out by Dr. Woodman and his colleagues, the results obtained at three different levels of protein supply were compared, using both individual-feeding and group-feeding methods. In each instance the feeding period (112 days) was divided into three stages, the rations being varied when the pigs reached 90 lb. live-weight, and again at 150 lb. live-weight. In group feeding, the average live-weight of the group was taken for this purpose. The rations used are set out below in parts by weight, the terms Normal Protein, Higher Protein, and Highest Protein being used to describe the three treatments compared.

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			<i>A.</i> <i>Normal protein</i>	<i>B.</i> <i>Higher protein</i>	<i>C.</i> <i>Highest protein</i>
<i>Up to 90 lb. L.W.</i>					
Barley meal	55	45
Weatings ..	..	..	..	31	31
Lucerne meal ..	..	..	..	2	2
White fish meal ..	..	..	..	12	12
Meat meal ..	..	..	..	—	5
Extracted soya meal ..	..	..	..	—	5
Per cent. crude protein in ration			17·48	22·13	26·77
<i>90 to 150 lb. L.W.</i>					
Barley meal ..	..	..	..	65	55
Weatings ..	..	..	..	23	23
Lucerne meal ..	..	..	..	2	2
White fish meal ..	..	..	..	10	10
Meat meal ..	..	..	..	—	5
Extracted soya meal ..	..	..	..	—	5
Per cent. crude protein in ration			15·93	20·58	25·22
<i>150 lb. L.W. to slaughter.</i>					
Barley meal ..	..	..	..	80	70
Weatings ..	..	..	..	13	13
Lucerne meal ..	..	..	..	2	2
White fish meal ..	..	..	..	—	—
Meat meal ..	..	..	..	2½	7½
Extracted soya meal ..	..	..	..	2½	7½
* Minerals ..	..	..	..	1	—
Per cent. crude protein in ration			12·25	16·94	21·66

* Composed of 1 part by weight of common salt to 3 parts of ground chalk.

It will be noted that the increases of protein content were effected by the replacement of part of the barley meal by an equal weight of meat meal and soya meal in equal parts; and that the proportion of total "protein concentrates" in the rations ranged from 12 to 32 per cent. in the first period, from 10 to 30 per cent. in the second, and from 5 to 25 per cent. in the third period. The effect of these differences upon the protein contents of the rations as a whole is also shown, these ranging roughly from 17 to 27, 16 to 25, and 12 to 22 per cent. respectively in the three periods.

Apparently the high protein rations were consumed as freely as the control rations and without any outward symptoms of detriment to the pigs.

Ten pigs were placed upon each treatment, both in the individual-feeding and in the group-feeding tests, every precaution being taken to ensure as nearly as possible an ideal lay-out in the distribution of the pigs between the different treatments.

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The pigs were the progeny of eight pure-bred Large White sows from the University Farm, and did not vary in age more than ten days. In the individual-feeding test the range of age was only four days. At the commencement of the experiment proper, the range of live-weights in the individual-feeding test was from $28\frac{1}{2}$ lb. to $50\frac{1}{2}$ lb., and in the group-feeding test from 28 lb. to 59 lb.

In view of the complexity of the experiments it is clearly impossible to give more than a very imperfect summary of the results here, but the averages tabulated below give a fair indication of the general character of the results obtained with respect to growth-rates and efficiency of utilization of food.

Treatment	Individual-Feeding			Group-Feeding		
	Mean L.W.I. per day	Mean lb. per 1 lb. L.W.I.	Mean lb.	Mean L.W.I. per day	Mean lb. per 1 lb. L.W.I.	Mean lb.
	lb.	lb.	lb.	lb.	lb.	lb.
A ..	1.35	3.33	1.27	3.62		
B ..	1.31	3.42	1.26	3.60		
C ..	1.27	3.46	1.18	3.78		

The differences in every instance are quite small as compared with the range of variation in the data for the individuals on any one treatment, and even in the earliest period (up to 90 lb. L.W.), when any influence of extra protein in improving the rate of growth might have been expected to be most clearly shown, there was no evidence of any such effect.

One can only conclude, therefore, that, under the conditions and with the rations used in these experiments, the very large increase in protein supply had very little effect on the progress of the pigs, whether measured in terms of rate of live-weight increase or efficiency of food conversion.

It is of interest to note, indeed, that both the growth-rate and the food factor tended to deteriorate slightly as the protein supply was increased, a phenomenon that was shown at all stages in the individual-feeding test, and in the main also in the group-feeding test. The small drop in rate of live-weight increase shown above between the A and C averages was definitely due to the different treatments, but probably finds its explanation in a slight lowering of the net energy (starch equivalent) of the C rations rather than in any direct effect of the excess protein.

That a considerable proportion of the extra protein fed in Treatments B and C was not being stored as such in the

NOTES ON FEEDING

pigs' bodies, but was being broken up ("deaminated") and the surplus nitrogen removed in the urine, found probable confirmation also in the observation that the water consumption of the pigs on these diets was considerably increased.

It is further recorded that the pigs showed no notable differences of shape and conformation as between one treatment and another, such as might have been expected if there had been considerable differences in the ratio of protein (lean meat) storage to fat production.

Turning aside for a moment from the main purpose of the experiments, it is of interest to note that, after recovering from the initial disturbance involved in getting accustomed to the individual-feeding procedure, the individually-fed pigs did rather better than the group-fed pigs. Thus the average number of days required to grow from 49 lb. to 200 lb. live-weight in the three groups of the former test were 107.8, 112.0, and 114.3 days respectively, and for the corresponding lots in the group-feeding test 116.6, 116.5 and 122.8 days. A similar difference in meal consumption was also found in favour of the individual feeding, the average saving in meal per head in raising the live-weight from 43 lb. to 193 lb. being 40 lb., or 7 per cent. of the average food consumption of the group-fed pigs.

Other points of general interest that come out of the statistical examination of the growth and food consumption data are (1) a slight, yet "significant," difference in rate of growth in favour of gilts over hogs, (2) a slight advantage of gilts in efficiency of food conversion, (3) only a low degree of correlation between either weaning weights or the initial weights at the start of the experiments and the rates of live-weight increase recorded.

Turning next to the results of the examination of the carcasses, which was of a very detailed character, we find also that no evidence could be obtained of any appreciable alteration in the type or quality of the carcass that could be traced to the high protein feeding. In every criterion of quality studied, the differences between individual carcasses within any one feeding group were always much greater than the average differences between the groups.

Thus there was no significant effect on the thickness of back-fat and belly streak; or on the percentage of fat and lean in three typical rashers from the belly, back and gammon. The character of the feeding was also without significant influence

NOTES ON FEEDING

on (a) the size of the "eye" muscle, (b) the length of the pigs, (c) the carcass percentages, (d) the weight of the flares, (e) the weight of the fillet (psoas muscle) or the percentage of water in it, (f) the mean iodine values of the fillet fat, and (g) the mean weights of the sides and gammons.

There was some evidence that the high protein feeding may have caused a very slight softening of the back-fat, but the effect was too small to be of practical significance, and may in fact have been due to other causes.

In view of the theoretical possibilities of injury to the kidneys through excessive feeding of protein, it is of interest to note that with the pigs on the highest protein rations (Treatment C) there was a significant increase in the weight of the kidneys, which otherwise had a perfectly normal and healthy appearance. Since no such increase was found in the pigs on Treatment B, however, we may conclude that the risks of serious kidney disorder with the rations commonly used in pig-feeding is not serious.

Gilts produced somewhat leaner carcasses than hogs, graded rather better, and had a tendency to produce a slightly longer carcass and heavier fillet, although the differences in the two latter respects were hardly large enough to be conclusive.

In view of the controversy as to whether the thickness of the shoulder fat is a sufficiently accurate criterion of the general condition of fatness of the pig, it is of interest to note that the Cambridge data show a very strong correlation between the mean back-fat and shoulder-fat measurements, so that apparently these measurements were of about equal value as an index of thickness of fat along the back. The correlation between mean back-fat and the percentage of fat in the complete rasher was, however, only significant with the hogs, and not with the gilts, and, therefore, especially in view of the limited data available, it would not be safe to assume that either the thickness of the shoulder fat or the average of the maximum and minimum thickness of back-fat are entirely satisfactory criteria of the general fatness of the carcass.

In concluding this brief survey of the valuable Cambridge report, it may be desirable to repeat the note of caution with which it ends, that the findings of the investigation "are, strictly speaking, referable only to the particular strain of Large Whites forming the experimental animals in the present

NOTES ON FEEDING

trial, and possibly only to animals of this strain in so far as they subsist on rations made up from the foods used in the present feeding treatments."

Evidence that the broad general findings, as to the ineffectiveness of high protein supply in enhancing growth rate and carcass quality, are more widely applicable, is already available, however, in the records of the numerous feeding experiments dealing with the same subject that have been carried out during the past ten years at the Harper Adams College. These experiments have consistently failed to show any advantage, either in growth-rate or leanness of carcass, from increasing the concentration of protein in the rations beyond a level similar to, or even slightly lower than, that used in the "control" rations of the Cambridge investigations.

The recent co-operative tests along similar lines that have been carried out at the Scottish agricultural colleges, and of which mention was made in the opening paragraph of these notes, have also led to a similar conclusion.

There would thus appear to be quite adequate warrant now for the advice to the practical pig-feeder that there is no advantage to be gained by introducing more protein into his rations than corresponds to a level of about 17 per cent. total protein for the weaner, reduced gradually to about 12 per cent. for the 200-lb. baconer. A weaner ration that will comply roughly with this standard can be made from 5 parts ground cereals, 3 parts weatings, and 1 part protein concentrate (50 per cent. protein), and from this starting point the proportion of ground cereals may be gradually increased until, for the final stages, a mixture of 16 parts cereals, 3 parts weatings and 1 part protein concentrate is reached.

FARM VALUES OF FEEDING STUFFS

The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

		<i>Starch equivalent Per cent.</i>	<i>Protein equivalent Per cent.</i>	<i>Per ton £ s.</i>
Barley (imported)	71	6·2	6 15	
Maize	78	7·6	5 13	
Decorticated ground-nut cake ..	73	41·3	7 18	
" cotton-seed cake ..	68	34·7	7 17	
(Add 10s. per ton, in each instance, for carriage.)				

The cost per unit starch equivalent works out at 1·68 shillings, and per unit protein equivalent 1·29 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The " food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the November, 1936, issue of the Ministry's JOURNAL, p. 816).

FARM VALUES

Crop	Starch equivalent		Food value per ton, on farm
	Per cent.	Per cent.	
Wheat	72	9·6	6 13
Oats	60	7·6	5 11
Barley	71	6·2	6 7
Potatoes	18	0·8	1 11
Swedes	7	0·7	0 13
Mangolds	7	0·4	0 12
Beans	66	10·7	6 16
Good meadow hay	37	4·6	3 8
Good oat straw	20	0·9	1 15
Good clover hay	38	7·0	3 13
Vetch and oat silage ..	13	1·6	1 4
Barley straw	23	0·7	2 0
Wheat straw	13	0·1	1 2
Bean straw	23	1·7	2 1

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d., post free 7d.

PRICES OF FEEDING STUFFS

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
Wheat, British ..	8 18	0 8	8 10	72	2 4	1.25	9.6
Barley, British feeding ..	7 0	0 8	6 12	71	1 10	0.98	6.2
" Danubian ..	7 3	0 8	6 15	71	1 11	1.03	6.2
" Persian ..	6 8*	0 8	6 0	71	1 8	0.89	6.2
Oats, English, white ..	7 0	0 9	6 11	60	2 2	1.16	7.6
" black and ..							
" grey ..	7 0	0 9	6 11	60	2 2	1.16	7.6
" Scotch, white ..	8 7	0 9	7 18	60	2 8	1.43	7.6
" Canadian, No. 2 ..							
" Western ..	8 13*	0 9	8 4	60	2 9	1.47	7.6
" Canadian, ..							
" mixed feed ..	6 15	0 9	6 6	60	2 1	1.12	7.6
Maize, Argentine ..	5 13	0 7	5 6	78	1 4	0.71	7.6
" Danubian Gal. Fox ..	6 3†	0 7	5 16	78	1 6	0.80	7.6
" South African, ..							
" No. 2 White flat ..	7 2†	0 7	6 15	78	1 9	0.94	7.6
Beans, English, Winter ..	6 08	0 16	5 4	66	1 7	0.85	19.7
Peas, English, blue ..	11 10§	0 14	10 16	60	3 2	1.70	18.1
" Japanese ..	19 3†	0 14	18 9	60	5 4	2.86	18.1
Milling Offals :—							
Bran, British ..	6 15	0 15	6 0	43	2 9	1.47	9.9
" broad ..	7 5	0 15	6 10	43	3 0	1.61	10
Middlings, fine, ..							
" imported ..	7 2	0 12	6 10	69	1 11	1.03	12.1
Weatings‡ ..	7 5	0 14	6 11	56	2 4	1.25	10.7
" Superfine‡ ..	7 17	0 12	7 5	69	2 1	1.12	12.1
Pollards, imported ..	6 15	0 14	6 1	50	2 5	1.29	11
Meal, barley ..	8 10	0 8	8 2	71	2 3	1.20	6.2
" grade II ..	7 15	0 8	7 7	71	2 1	1.12	6.2
" maize ..	6 7	0 7	6 0	78	1 6	0.80	7.6
" germ ..	6 7	0 11	5 16	84	1 5	0.76	10.3
" locust bean ..	7 15	0 5	7 10	71	2 1	1.12	3.6
" bean ..	8 5	0 16	7 9	66	2 3	1.20	19.7
" fish, white ..	14 10	2 1	12 9	59	4 3	2.28	53
Maize, cooked, flaked ..	6 15	0 7	6 8	84	1 6	0.80	9.2
" gluten feed ..	6 10	0 12	5 18	76	1 7	0.85	19.2
Linseed cake—							
English, 12% oil ..	9 2	1 0	8 2	74	2 2	1.16	24.6
" 9%	8 12	1 0	7 12	74	2 1	1.12	24.6
" 8%	8 7	1 0	7 7	74	2 0	1.07	24.6
" 6%	8 12§	1 0	7 12	74	2 1	1.12	24.6
Cottonseed cake,							
English, Egyptian seed, 4½% oil ..	5 7	0 17	4 10	42	2 2	1.16	17.3
Cottonseed cake,							
Egyptian, 4½% oil ..	5 5	0 17	4 8	42	2 1	1.12	17.3
Cottonseed cake, decorticated, 7% oil ..	7 17†	1 7	6 10	68	1 11	1.03	34.7
Cottonseed, meal decorticated, 7% oil ..	7 15†	1 7	6 8	70	1 10	0.98	36.8

PRICES OF FEEDING STUFFS (continued)

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
Coco-nut cake, 6% oil..	£ s. 6 15	£ s. 0 17	£ s. 5 18	77	s. d. 1 6	d. 0·80	% 16·4
Ground-nut cake, decorticated, 6·7% oil	7 17†	1 7	6 10	73	1 9	0·94	41·3
Ground-nut cake, imported decorti- cated, 6·7% oil ..	8 0	1 7	6 13	73	1 10	0·98	41·3
Palm-kernel cake, 4½-5½% oil ..	6 15†	0 12	6 3	73	1 8	0·89	16·9
Palm-kernel cake meal, 4½% oil ..	6 12†	0 12	6 0	73	1 8	0·89	16·9
Palm-kernel meal, 1-2% oil ..	6 2	0 12	5 10	71	1 7	0·85	16·5
Feeding treacle ..	5 0	0 8	4 12	51	1 10	0·98	2·7
Brewers' grains, dried ale ..	5 17	0 11	5 6	48	2 2	1·16	12·5
Brewers' grains, dried porter ..	5 10	0 11	4 19	48	2 1	1 12	12·5

* At Bristol.

§ At Hull.

† At Liverpool.

‡ In these instances manurial value, starch equivalent and protein equivalent are provisional.

NOTE : The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the beginning of November, 1936, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then since its manurial value is £1 per ton as shown above, the cost of food value per ton is £9. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 5d. Dividing this again by 22·4, the number of pounds of starch equivalent in one unit, the cost per lb. of starch equivalent is 1·29d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices :—N., 7s.; P₂O₅, 2s. 3d.; K₂O, 3s. 6d.

MISCELLANEOUS NOTES

Importation of Narcissus Bulbs into the United States

THE Ministry has received from the Bureau of Entomology and Plant Quarantine of the United States Department of Agriculture a copy of a circular (B.E.P.Q. 412) dated September 16, 1936, and entitled "Information for Prospective Importers regarding the entry of Foreign Narcissus Bulbs on and after 15th December, 1936."

From that date, as has been previously announced, the existing embargo on the entry into the United States of certain varieties of Narcissus bulbs will be raised, and permits will be obtainable for the entry of all classes of Narcissus bulbs, which must, however, as in the past, be accompanied by official certificates of health issued in the country of origin.

It is now announced in the present circular, that in view of the difficulty of determining by external examination the freedom of Narcissus bulbs from infestation with the Bulb Eelworm (*Anguillulina dipsaci*), plant quarantine inspectors will require all imported Narcissus bulbs to be given "the latest approved treatment" as a condition of entry.

The term "latest approved treatment" will be construed as consisting of soaking the bulbs in water at a temperature of 70 to 80° F., preferably 75°, for a period of two hours, after which the bulbs are to be kept in hot water until all the bulbs have reached a temperature of 110 to 111° F., throughout. The bulbs are then to be kept in hot water at a temperature of not less than 110° F., for a period of four hours. As a precautionary measure to check the subsequent dissemination of diseases such as basal rot, a pint of formalin may be added for each 35 gal. of water, but the addition of the disinfectant is optional with the importer.

Treatment may be given at the port of first arrival or at any point designated in the permit, but the permittee will be required to have available at such place of treatment the services of a treating plant capable of treating the importation according to the method prescribed above. Applicants for permits to import Narcissus bulbs are asked to state, when submitting the application for permit, the point and premises at which they propose to have the bulbs treated.

All charges incident to such hot-water treatment are to be met by the importer or owner, but there will be no charges for the services of a plant quarantine inspector to supervise the treatment.

MISCELLANEOUS NOTES

The Agricultural Index Number

THE general index number of prices of agricultural produce for October is 125 (corresponding month of 1911-13 = 100), or 2 points lower than a month earlier, but 12 points above the figure recorded for October, 1935. (If allowance be made for payments under the Wheat Act, 1932, and the Cattle Industry (Emergency Provisions) Act, 1934, the revised index number becomes 129.) The principal price increases were in respect of wheat, oats, fat pigs, eggs, butter, milk and potatoes, whereas average quotations for barley, fat cattle and cheese were lower on the month.

Monthly index numbers of prices of Agricultural Produce. (Corresponding months of 1911-13 = 100.)

Month.	1931	1932	1933	1934	1935	1936
January .. .	130	122	107	114	117	119
February .. .	126	117	106	112	115	118
March .. .	123	113	102	108	112	116
April .. .	123	117	105	111	119	123
May .. .	122	115	102	112	111	115
June .. .	123	111	100	110	111	116
July .. .	121	106	101	114	114	117
August .. .	121	105	105	119	113	119
September .. .	120	104	107	119	121	127
October .. .	113	100	107	115	113	125
November .. .	112	101	109	114	113	—
December .. .	117	103	110	113	114	—

Revised monthly index numbers of prices of Agricultural Produce, allowing for payments under the Wheat Act (a) and the Cattle Industry (Emergency Provisions) Act (b).

Month	1932	1933	1934	1935	1936
January .. .	—	111	119	124	125
February .. .	—	110	117	122	123
March .. .	—	106	112	119	122
April .. .	—	109	116	126	129
May .. .	—	105	110	117	120
June .. .	—	104	114	117	121
July .. .	—	104	117	120	121
August .. .	108	108	122	120	124
September .. .	108	111	125	128	133
October .. .	104	112	121	120	129
November .. .	105	113	120	119	—
December .. .	107	114	120	120	—

(a) Commenced August, 1932. (b) Commenced September, 1934.

Grain. The average price of wheat at 8s. 5d. per cwt. was 1s. 1d. higher than in September, and the index moves

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upwards from 98 to 113. (If the "deficiency payment" under the Wheat Act, 1932, is taken into consideration the figure is 131.) Barley, at 10s. 1d. per cwt., showed a reduction of 3d., which, in conjunction with a reverse movement in the base price, results in the index falling by 5 points to 119. Oats, at 6s. 10d. per cwt., compared with 6s. 7d. in the previous month, and the index rises from 98 to 99. In October, 1935, wheat averaged 5s. 11d. per cwt., barley 9s. 4d., and oats 6s. 2d., the relative indices being 80, 110 and 89.

Live Stock. Fat cattle showed a further reduction in price during October, second quality averaging 31s. 8d. per live cwt. as against 32s. 10d. in September, and the index at 95 is lower by 3 points; the effect of adding the subsidy under the Cattle Industry (Emergency Provisions) Act, 1934, is to raise the index to 109. At an average of 9½d. per lb, for second quality, fat sheep were unaltered both in price and index (131). Quotations for baconers rose by 3d. to 11s. 8d. per score (20 lb.), and those for porkers by 1s. 1d. to 12s. 11d., the respective indices moving from 111 to 114 and 109 to 119.

Dairy cows were dearer than in September, and the index at 107 is higher by 4 points. On the other hand, store cattle were slightly cheaper, the index declining from 97 to 95. Store sheep and pigs made rather more money; the index for the former remains unchanged at 132, while that for the latter is 12 points above the September figure of 138.

Dairy and Poultry Produce. The regional contract price of milk rose on the month by 2d. per gal., but in consequence of a larger increase during the base period, the latest index at 171 is lower by 31 points. Butter, at 1s. 1½d. per lb., compared with 1s. 1¼d. per lb. in September, and, as the same increase was recorded during the corresponding months of 1931-3, the index at 98 is unaltered. Average quotations for eggs at 19s. 7d. per 120 were higher by 4s. 10d., the index rising from 124 to 141. Cheese was slightly reduced in price, although the fall of 5 points in the index is due principally to the upward movement in the base prices. Average quotations and indices for poultry were rather variable during the month under review, but geese were considerably firmer in price; the combined index rises from 113 to 115.

Other Commodities. Potatoes at £7 5s. 6d. per ton rose by £1 15s. per ton, and the index moves upwards by 53 points to 202. Last month's prices of clover and meadow hay were about maintained, but, owing to a rise having

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occurred between September and October in the base years, the combined index of 102 shows a fall of 3 points. At 1s. $1\frac{1}{4}$ d. per lb., wool was $\frac{1}{4}$ d. more than in September, and the index is increased by 2 points to 102.

Monthly Index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity.	1934		1935		1936		
	Oct.	Oct.	July	Aug.	Sept.	Oct.	
Wheat	67	80	86	96	98	113
Barley	111	110	84	100	124	119
Oats	94	89	83	98	98	99
Fat cattle	97	92	100	102	98	95
,, sheep	128	121	128	128	131	131
Bacon pigs	99	90	113	111	111	114
Pork	112	99	106	107	109	119
Eggs	115	118	123	130	124	141
Poultry	116	117	117	113	113*	115
Milk	161	171	175	175	202	171
Butter	84	95	100	100	98	98
Cheese	93	82	113	113	106	101
Potatoes	151	152	139	109	149	202
Hay	101	91	82	98	105	102
Wool	85	89	94	95	100	102
Dairy cows	107	107	104	103	103	107
Store cattle	85	90	101	101	97	95
,, sheep	114	120	113	126	132	132
,, pigs	143	124	126	133	138	150

Revised index numbers due to payments under the Wheat Act and the Cattle Industry (Emergency Provisions) Act.

Wheat ..	..	117	122*	112	122	130	131
Fat cattle ..	..	112	107	114	117	113	109
General Index ..	..	121	120	121	124	133	129

* Superseding figure previously published.

Foot-and-Mouth Disease.—As no further outbreak of Foot-and-Mouth Disease occurred in the Oxfordshire Infected Area after October 18 the area was freed from restrictions on November 9.

Three further outbreaks were confirmed in the Flintshire and Cheshire Infected Area, two at Little Saughall, Chester, on October 23 and October 29 respectively, and one at Huntington, Chester, on October 30. There have been nine outbreaks in this area since the initial outbreak was confirmed at Sealand on October 15. The disease position was satisfactory on November 4, and, therefore, the area under restrictions was reduced on that date to a zone extending approximately five miles round the infected premises at Sealand and Churton Heath. Restrictions were finally removed from this area on November 21.

Outbreaks were confirmed at Lymington, Hampshire, on October 27; at Ludgvan, Cornwall, on October 29; and at South Elmham, St. Michaels, Halesworth, Suffolk, on November 2. The usual restrictions were imposed over areas of approximately 15 miles radius round each of the infected

MISCELLANEOUS NOTES

premises. Further outbreaks were confirmed at Brockenhurst, in the Hampshire Infected Area, on October 29 and at Halesworth, in the Suffolk Infected Area, on November 8. Orders were issued contracting the Hampshire Area on November 11, the Cornwall Area on November 13 and the Suffolk Area on November 17, in each case to approximately five miles round the infected premises. Both the Hants and the Cornwall areas were freed from restrictions on November 20, and the Suffolk area was released from restrictions on November 30.

A fresh outbreak was confirmed at Idless, Truro, Cornwall, on November 21, and the usual restrictions were imposed over an area of approximately 15 miles round the infected premises. As emergency restrictions had been in operation since November 18, and the position was satisfactory, arrangements were made to contract the area to approximately 5 miles on December 3. Two outbreaks were confirmed at Bosley, Macclesfield, Cheshire, on November 23 and 26 respectively, and at Foolow, Eyam, Derbyshire, on November 27. The usual restrictions have been imposed over an area of approximately 15 miles round the infected premises.

Farm Workers' Minimum Rates of Wages.—Meetings of the Agricultural Wages Board were held at King's Buildings, Smith Square, London, S.W.1., on October 27, and November 17, 1936, Mr. W. B. Yates, C.B.E., D.L., J.P., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages, and proceeded to make the following Orders :—

Bedfordshire and Huntingdonshire.—An Order cancelling the existing minimum and overtime rates of wages and fixing fresh rates in substitution therefor to come into operation on November 1, 1936, and continue in force until October 30, 1937. The minimum rates for male workers of 21 years of age and over are 32s. 6d. (instead of 31s. 6d. as at present) per week of 50 hours in summer, except in the weeks in which Easter Monday and Whit Monday fall, when the hours are 41; and 48 hours in winter, except in the week in which Christmas Day and Boxing Day fall, when the hours are 31, with overtime throughout the period at 9½d. per hour on weekdays, 10½d. per hour on Easter Monday, Whit Monday, Christmas Day and Boxing Day and 11½d. per hour on Sundays (instead of 9½d., 10½d. and 11½d. respectively as at present). The minimum rates for female workers of 18 years of age and over remain unchanged at 6½d. per hour with overtime at 7½d. per hour on weekdays, 8½d. on Easter Monday, Whit Monday, Christmas Day and Boxing Day and 9½d. per hour on Sundays.

Cheshire.—An Order fixing minimum and overtime rates of wages to come into force on November 1, 1936 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until October 31, 1937. The minimum rates for male workers of 21 years of age and over are 34s. (instead of 32s. 6d. as at present) per week of 54 hours, with overtime at 9d. per hour (instead of 8½d. as at present). For female workers of 18 years of age and over the minimum rate is unchanged at 6d. per hour for all time worked, provided that, in the case of female workers engaged for milking, such workers shall receive not less than 6d. per " meal " (i.e., each occasion on which the worker visits her place of employment for the purpose of milking).

Northamptonshire and Soke of Peterboro'.—An Order fixing minimum and overtime rates of wages to come into force on November 1, 1936 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until October 30, 1937. The minimum rates for male workers of 21 years of age and over are 32s. 6d. (instead of 31s. 6d. as at present) per week of 48 hours in winter, except in the week

MISCELLANEOUS NOTES

in which Christmas Day falls, when the hours are $39\frac{1}{2}$, and 50 hours in summer, except in the weeks in which Easter Monday and Whit Monday fall, when the hours are 41, with overtime at 10d. per hour (instead of 9d. per hour as at present) on weekdays, and 1s. per hour (instead of 11d. per hour as at present) on Sundays, Christmas Day, Easter Monday and Whit Monday. The minimum rates for female workers of 18 years of age and over remain unchanged at 6 $\frac{1}{2}$ d. per hour with overtime at 7 $\frac{1}{2}$ d. per hour on weekdays and 9d. per hour on Sundays, Christmas Day, Easter Monday and Whit Monday.

Shropshire.—An Order cancelling the existing minimum and overtime rates of wages and fixing fresh rates in substitution therefor to come into force on November 1, 1936, and to continue in operation until May 31, 1937. The minimum rates for male workers of 21 years of age and over are 32s. 6d. (as at present) per week of 54 hours, except in the weeks in which Christmas Day and Good Friday fall, when the hours are 44 $\frac{1}{2}$ (instead of 54 hours throughout the whole period as at present), with overtime unchanged at 9d. per hour on weekdays and for attention to stock on Sundays, and 10d. per hour for other employment on Sundays. The minimum rates for female workers of 18 years of age and over remain unchanged at 5d. per hour with overtime at 6d. per hour.

Staffordshire.—An Order varying the existing minimum and overtime rates of wages as from November 22, 1936. The minimum rates for male workers of 21 years of age and over are 32s. 6d. (as at present) per week of 54 hours, except in the weeks in which Christmas Day and Good Friday fall, when the hours are 44 $\frac{1}{2}$ (instead of 54 hours throughout the year as at present) with overtime unchanged at 9d. per hour. The minimum rates for female workers of 18 years of age and over remain unchanged at 5d. per hour, with overtime at 6d. per hour.

East Riding of Yorkshire.—(1) An Order fixing minimum and overtime rates of wages to come into force on November 24, 1936 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until November 23, 1937. The minimum rate for male workers of 21 years of age and over is 34s. 6d. (instead of 33s. 6d. as at present) per week of 52 $\frac{1}{2}$ hours in summer, except in the weeks in which Good Friday and Coronation Day fall, when the hours are 43, and 48 hours in winter except in the week in which Christmas Day falls, when the hours are $39\frac{1}{2}$, with, in addition in the case of workers living in, not more than 12 hours per week on weekdays and 3 hours on Sunday spent on the care of and attention to stock. The overtime rates for male workers of 21 years of age and over are 10d. per hour on weekdays and 1s. per hour on Sundays, Good Friday, Coronation Day and Christmas Day. The minimum rates for female workers of 16 years of age and over remain unchanged at 6d. per hour with overtime at 9d. per hour.

(2) An Order fixing minimum differential rates of wages for overtime employment on the Corn Harvest of 1937, the rate for male workers of 21 years of age and over being 1s. 3d. per hour and for female workers of 16 years of age and over 11d. per hour (as in 1936).

North Riding of Yorkshire.—An Order fixing minimum and overtime rates of wages to come into force on November 24, 1936 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until November 23, 1937. The minimum rate for male workers of 21 years of age and over (other than casual workers) is 34s. (instead of 33s. as at present) per week of 50 hours in winter, except in the week in which Christmas Day falls, when the hours are 41, and 52 $\frac{1}{2}$ hours in summer, with payment for employment in connexion with the care of and attendance upon animals where the total

MISCELLANEOUS NOTES

hours exceed the number mentioned above, unchanged at 3d. per hour for those workers who are boarded and lodged by their employer, and 6d. per hour for those who are not so boarded and lodged. The overtime rates are unchanged at 9d. per hour on weekdays and 11d. per hour on Sundays and on Christmas Day. For male casual workers of 18 years of age and over the minimum rate remains unchanged at 7d. per hour for all time worked. For female workers of 18 years of age and over the minimum rate is 6d. per hour, provision being made in the case of whole time workers for payment at not less than 22s. per week of 36 hours in the week in which Christmas Day falls and 44 hours in any other week, with overtime at 9d. per hour.

Carmarthenshire.—An Order fixing minimum and overtime rates of wages to come into force on November 15, 1936 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until November 14, 1937. The minimum rates for male workers of 21 years of age and over are 32s. (instead of 31s. 6d. as at present) per week of 54 hours with overtime unchanged at 8½d. per hour. For female workers of 18 years of age and over the rates are 5d. per hour with overtime at 6d. per hour as at present.

Glamorganshire.—An Order fixing minimum and overtime rates of wages for male workers wholly or mainly employed in forestry to come into force on November 1, 1936, and to continue in operation until November 1, 1937. The minimum rates for male workers of 21 years of age and over are 39s. per week of 48 hours in winter and 52 hours in summer, with overtime at 11d. per hour.

Enforcement of Minimum Rates of Wages.—During the month ending November 13, 1936, legal proceedings were taken against fifteen employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow:—

Committee Area	Court	Fines Imposed	Costs Allowed	Arrears of Wages ordered	No. of workers involved
Cheshire . .	Macclesfield	£ 6 0 0	4 4 0	51 11 4	4
Derby . .	Chesterfield	30 0 0	(a)	30 4 5	2
" . .	" Ashbourne	7 10 0	(a)	20 0 0	1
Lancs . .	Rochdale . .	(b)	2 17 6	30 0 0	1
" . .	Royton . .	(c)	0 9 6	13 0 0	1
Lincs (Kesteven and Lindsey) . .	Grantham . .	10 0 0	3 16 0	110 0 0	5
Suffolk . .	Halesworth . .	5 0 0	0 8 0	37 8 9	4
Sussex . .	Mark Cross . .	1 0 0	2 4 0	7 11 9	1
Yorks, W.R. . .	Halifax . .	2 0 0	0 6 0	50 0 0	1
" . .	Wetherby . .	2 0 0	—	12 0 0	1
Brecon . .	Builth Wells . .	1 0 0	1 12 6	21 10 9	1
" . .	Crickhowell . .	1 0 0	—	36 10 0	1
Carmarthen . .	Llangadock . .	(d)	—	—	1
Glamorgan . .	Bridgend . .	4 0 0	2 12 0	13 12 8	2
		70 10 0	20 13 0	447 7 3	27

(a) Cost included in the fine. (b) Dismissed under the Probation of Offenders Act. (c) Conviction recorded. (d) Case dismissed.

WIRELESS TALKS TO FARMERS DECEMBER, 1936

<i>Station and Date</i>	<i>Time : p.m.</i>	<i>Speaker</i>	<i>Subject</i>
NATIONAL : December 7	6.20	Messrs. Anthony Hurd and Rees Owen	Smithfield Show. The Welsh Stockbreeder's Problem.
MIDLAND : December 6	5.45	Mr. Graham Castle	Our Country Correspondent : Gloucestershire. For Midland Farmers.
" 10	6.40	Mr. W. B. Thompson	
WELSH : December 11	7.30	Messrs. Moses Griffith and R. G. Gardner	Welsh Farming : Cattle Feeding : An Anglesey experiment. The buying and selling of store cattle. The history of the greatest Show in Britain, the Exhibition at Smith- field, London. Changes in the types of stock ex- hibited, difference in ages and reasons for this. Characteristics of various breeds ; adaptation to environment.
NORTH : December 4	6.40	Mr. C. E. Hudson	Gardening for Profit Tomatoes.
" 11	6.40	Mr. A. McVicar	Gardening for Profit : Mushrooms.
" 16	6.40	Mr. W. B. Mercer	For Northern Farmers in Particular : Sheep in General.
SCOTTISH : December 2	6.40	Mr. A. D. Buchanan Smith	The Scottish Fat-Stock Show.
" 9	6.30	Mr. R. L. Scarlett	For Scottish Farmers
" 17	6.40	Not yet fixed	Probably Rural Housing.
WEST : December 3	6.40	Mr. A. W. Ling and a poultry farmer	For Western Farmers in Particular : A discussion on poultry.
" 11	8.15	Mr. A. W. Ling	Christmas Markets : A conducted tour of Newton Abbot Fat Stock Show.
" 17	6.40	Mr. A. W. Ling	For Western Farmers in Particular.
" 7	9.10	Mr. D. Harris	For Western Gardeners.

Gardening talks this month will be given again under the editorship of C. H. Middleton, who, on December 6, will discuss trees with Mr. Le Sueur; and, on the 13, talk about seasonal topics. On December 20, Mr. Middleton is bringing some well-known people to the microphone to talk about how the Coronation affects horticulture. Among the speakers will be Colonel Durham, Secretary of the Royal Horticultural Society; Mr. George Monro, of Covent Garden Market; Mr. T. Hay, of Hyde Park, and a well-known West End florist. In the last talk this year Mr. Middleton will review the year's work and look forward to the future.

APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS : ENGLAND

Cheshire : Miss G. M. Ashforth, N.D.P., has been appointed Student Demonstrator in Poultry-keeping, *vice* Miss U. M. Heler, N.D.P.

Cumberland and Westmorland : Miss A. R. Pinkerton, N.D.P., has been appointed Assistant Poultry Instructor, *vice* Miss K. Thompson, N.D.P.

Essex : Mr. R. Robertshaw, N.D.A., N.D.D., has been appointed Assistant Lecturer in Agriculture.

Mr. F. C. Creyke, N.D.A., N.D.D., has been appointed Assistant Dairying Instructor, *vice* Mr. R. Robertshaw, N.D.A., N.D.D.

Amendment of notification in the November, 1936, issue of this Journal.

NOTICES OF BOOKS

The Genetics of the Pig. By A. D. Buchanan Smith, O. J. Robison and D. M. Bryant. Reprint from *Bibliographia Genetica*, XII, pp. 1-160. (Edinburgh : Institute of Animal Genetics, West Mains Road. 1936. Price 3s. 6d.)

This work constitutes the most complete study that has yet been made of the available data on the genetic characters of the pig. It begins with a section on chromosome numbers. It is shown that there are probably two types of chromosome complement with diploid numbers of 38 and 40. The possible explanation of the two types is that the domestic pig is a cross between *Sus scrofa* and *S. vittatus*, which are represented in varying proportions, most breeds being descended mainly from *S. vittatus*, while the pork or lard breeds, such as the Berkshire and Middle White, are chiefly based on *S. scrofa*. Here it may be remarked that comparable views, supported in each case by a considerable amount of evidence, have been put forward by Cossar Ewart and others as to the multiple origin of horses, cattle and sheep.

The section on colour inheritance is informative and useful, and the results obtained by different investigators are carefully analyzed. It is interesting to find that whereas "white" appears to be genetically the same for all breeds, there are several kinds of "black" and at least two genotypes for "red." In the chapter on hair and skin one would have liked more precise information as to the number and distribution of the sweat glands, since this point is of great interest in connexion with the physiology of heat regulation, but, as the author points out, the number of investigations on the physiology of the pig is very limited.

There are a few notes on the blood groups, the thermal metabolism and the thyroid gland, and these are followed by a section on the highly important subject of disease resistance, which is dealt with as fully as the data permit, and the results of different investigators are carefully criticized. A certain degree of resistance seems to be inherited, and this is the best that can be said at present. After a short and unimportant section on mental traits the genetics of sex and generation is dealt with at considerable length, and everything of importance seems to be included. The evidence as to the inheritance of fertility is well set out, as well as that relating to mothering ability and milking capacity. As indicating the scope and completeness of the memoir it may be mentioned that Baker's studies on the inter-sexuality of the New Hebridean pigs are duly referred to and discussed.

It is surprising that so little work has been done on the genetics of the anatomical characters, for the authors are able to dismiss this subject in less than six pages. In the much longer section on abnormalities and defects, investigations on twenty or more abnormal conditions are referred

NOTICES OF BOOKS

to and the evidence as to their inheritance is considered. One of the defects dealt with is "seedy-cut" or "black-belly," and the correlation between the pigment in the skin and that in the mammary glands is pointed out. It might have been added that in Tamworth pigs the pigment in the glands (really in the walls of the ducts of the glands) is sandy, corresponding to the red pigment in the hair, and that spaying, by inhibiting the development of the mammary glands, prevents the formation of the pigment in the ducts. The other defective conditions (syndactyly, polydactyly, bent-leg, hernia, cryptorchism, cleft palate, etc.) are dealt with as fully as the data permit, and as a summary of what is known on these matters the memoir should be of much value.

The book, however, is something more than a work on genetics, for it includes sections that deal with production and possible methods of improvement. In including these the authors have done wisely, for unless the productive qualities of the pig are analysed no ultimate synthesis is possible, and as Buchanan Smith and his colleagues have shown, there already exists knowledge that can be usefully employed for the improvement of the hereditary qualities. The memoir is provided with a very full bibliography and a good index.

The Land of Britain. The Report of the Land Utilization Survey of Britain. Edited by L. Dudley Stamp, B.A., D.Sc. Part 78.—Berkshire. By J. Stephenson, B.A., with an historical section by W. G. East, M.A. Pp. 111. Maps. (London: The Land Utilization Survey of Great Britain, London School of Economics, Houghton Street, London, W.C.2. 1936. Price 2s. 6d.)

The work of the Land Utilization Survey must already be widely known in rural circles, where it has been in progress for some years past. As readers of this JOURNAL will be aware, it is carried out under the ægis of the London School of Economics, and has been done with the co-operation of a large number of societies and educational authorities. The work is now drawing to a conclusion, and the publication of Part 78, dealing with the county of Berkshire, is the first harvest resulting from a great deal of spade-work.

If this report is a sample of what we are to expect as a result of the work, those who have looked forward to the publication of the results will not be disappointed. Considerable attention has been paid to the geographical background of the farming of Berkshire, and, although some critics may consider that John Orr's book on Berkshire, published some twenty years ago, would give them a more immediately comprehensible picture of the farming of the county, this work cannot be neglected. It has its basis in geographical foundations rather than in the sociological organization of the district. It shows the reason why particular kinds of farming are employed, rather than stating baldly the fact that particular systems are employed in particular districts.

Perhaps not the least valuable part of the volume is the survey, by W. G. East, of *Land Utilization in Berkshire about 1800*, which is based upon the reports of the old Board of Agriculture made at that time. Although this survey is very synoptic, it does afford a basis for comparison with the modern conditions, which cannot but be valuable.

A disadvantage that can be envisaged in connexion with the Land Utilization Survey is that it has occupied a long time, and it would appear that the publication of the particulars dealing with the separate counties will also occupy a long period. Moreover, if the present volume is a good sample, they will be rather technical. It might be an advantage if a rapid survey, carried out simultaneously by local authorities, and not too technical in statement, could be undertaken.

NOTICES OF BOOKS

Plant Breeding Abstracts : Supplement II. Pp. 63. (Cambridge : School of Agriculture. 1936. Price 5s.)

This supplement summarizes over 400 annual reports received at the Imperial Bureau of Plant Genetics, Cambridge, from stations in the British Empire during the year 1932-35. The range covered is vast, the crops dealt with including practically all economic plants with the exception of herbage plants. The work reported contains sections on breeding, cytology and the genetics of plant parasites. The supplement is planned so as to facilitate ready reference to the account of any given crop in any given country, and an extensive index is also provided.

Pedology. By Jacob S. Joffe. Pp. xvi + 575, illustrated. (Rutgers University Press, New Jersey. Price \$5.50.)

In the preliminary announcement of this work, it was described as "an authoritative treatise on soils from a pedologist—the first to appear in the English language." Ten incisive paragraphs proclaimed Pedology, now authoritatively expounded for the first time, to be the key to the problems of the agronomist, the forester, and the pomologist.

Thus heralded, it was not surprising that the appearance of Dr. Joffe's book was eagerly awaited by students of the soil. *Pedology* is now available and the reviewer may set himself to decide : (1) to what extent are the claims made for it justified ? and (2) what is the value of the book to students of the soil ?

On the first question, the reviewer does not feel that the work justifies the claims made for it beforehand. Insufficient attention is devoted to the exposition of the constitution and properties of soils, and practically no mention is made of the important subject of soil physics, including the moisture relationships of soils. Without an understanding of these matters, soil systematics cannot be placed on a secure foundation.

Exception may also be taken to the undue attention given to Russian work in a comprehensive account of the subject. Approximately one-half of the references are to Russian publications. This might be justified if it were admitted that pedology is mainly Russian. Even so, the newer Russian ideas, at variance with those of the classical school of Docuchaiev and Glinka, are not given attention.

As to the value of the work to the soil student, however, there can be no doubt. It is definitely written from the Russian standpoint, and is undoubtedly an able and much-needed exposition of the ideas of the Russian school. Dr. Joffe has rendered a great service by making available to English readers a large body of work which has hitherto been either inaccessible or accessible only in the form of abstracts. The more recent Russian work, which was probably published too late to be dealt with in the present book, will doubtless receive attention in the next edition, which will certainly be required.

The introductory chapters on the constitution and genesis of soils, although useful and suggestive, are, as mentioned above, inadequate for a treatise on the subject as a whole. The greater part of the book, some 400 pages, is devoted to soil systematics. Although, on account of the scarcity of material, some groups are insufficiently treated, this section as a whole provides a rich store of information, much of which is new to English readers. The chapters on the chernosems, podsols, and intrazonal soils are particularly valuable.

The book is well produced and adequately illustrated. It contains over 950 bibliographical references. Although it does not completely justify the great claims made in its announcement, it is, nevertheless, a valuable and important contribution to the literature of the subject.

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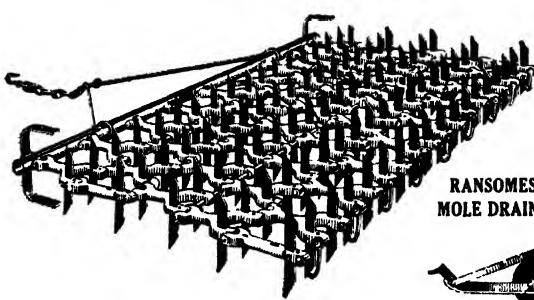
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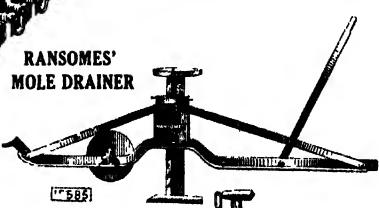
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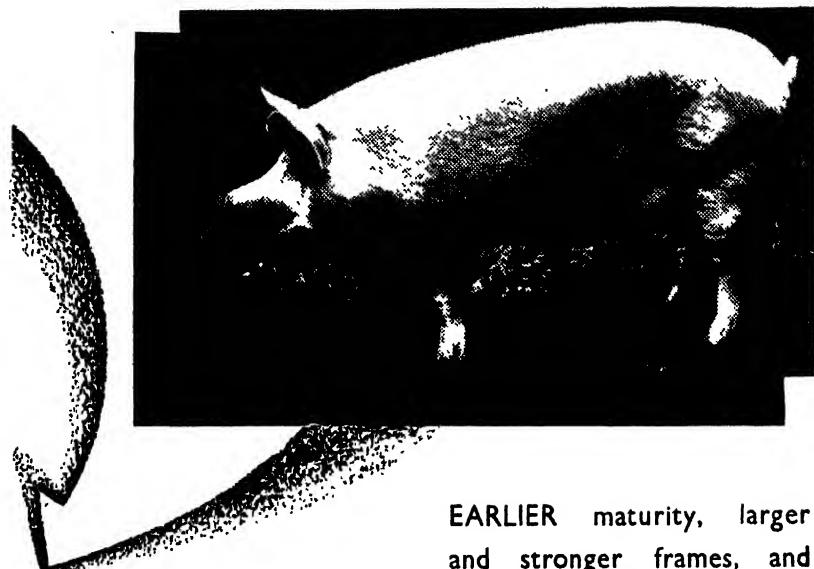
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Vol. XLIII No. 10 January, 1937

NOTES FOR THE MONTH

The Argentine Agreement and Agriculture in the United Kingdom

As Argentina supplies nearly two-thirds of our total beef imports, the new Agreement recently signed, to replace the "Roca" Agreement of 1933, is of special interest to the United Kingdom live stock industry. In general it provides for less favourable treatment of live stock products imported into this country from Argentina, and, in its provisions for the imposition of duties on beef and veal, and for the co-operation of the Argentine Government in proposals for the regulation of imports of beef through an International Conference, is in line with the live stock policy of the United Kingdom Government.

The 1933 Agreement guaranteed to Argentina free entry for all meats (except canned meats and meat extracts, on which the 10 per cent. duty was consolidated), but it provided for quantitative regulation of imports of frozen beef, mutton and lamb according to the programme set out in the Ottawa Agreements of 1932. This programme was fully carried out. Imports of foreign frozen beef, mutton and lamb were progressively reduced to 65 per cent. of Ottawa Standard Year quantities. Moreover, pork imports, not mentioned in the Agreement, were reduced by some 33½ per cent. Imports of chilled beef were limited in the 1933 Agreement to the Ottawa year quantity, with provision for a 10 per cent. reduction in certain circumstances. This conditional reduction was in fact imposed.

The chief innovation of the new Agreement is the provision for duties of $\frac{1}{4}d.$ a lb. on chilled beef and $\frac{1}{2}d.$ a lb. on frozen beef, and for corresponding duties (mainly 20 per cent. *ad valorem*) on other classes of beef imports. Should the incidence of the specific duty on chilled beef fall below a 20 per cent. *ad valorem* equivalent, the Agreement provides for corresponding modifications of the *ad valorem* duties in

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stages of $2\frac{1}{2}$ per cent. for six months at a time. Imports of mutton and lamb and pork are accorded entry free of duty into the United Kingdom, but they are to be subject to quantitative regulation.

The provisions in the Agreement for the quantitative regulation of imports of meat from Argentina are of considerable importance. For each of the various kinds of beef, Argentina receives a guarantee of both a minimum quantity and a minimum annual proportion of total regulated imports into the United Kingdom from foreign countries.

The minimum *proportion guarantees* are based on Argentina's share of the total foreign imports of the several classes of meat in some recent period. They have no significance other than as a safeguard to Argentina against unduly favourable treatment being afforded to other foreign countries.

The *quantities* which have been guaranteed as minima are in no instance higher and in some instances lower than recent levels. As regards chilled beef, which is by far the most important category, the 10 per cent. reduction on the Ottawa year level, to which a number of conditions were applied in the 1933 Agreement, is now confirmed unconditionally by the adoption of 1935 imports as the basic allocation; and this figure can be reduced by a quantity equivalent to 2 per cent. in any of the next three years, subject to a maximum reduction of 5 per cent. in the third year. For example, the Argentine allocation can be reduced by 2 per cent. of the 1935 quantity in 1937, a further 2 per cent. in 1938, and 1 per cent. (making 5 per cent. in all) in 1939.

As regards frozen beef, imports from Argentina have already been reduced by more than one-third since the Ottawa year, and that position is stabilized by the minimum quantitative guarantee. The guarantee for beef offals bears a percentage relationship to the combined allocations for chilled and frozen beef. The quantitative guarantee for canned beef, like that for frozen beef, will roughly stabilize the present level of foreign imports.

As with frozen beef, imports of mutton and lamb from Argentina to this country have been reduced since Ottawa by a full third. Argentina now supplies only about one-seventh of our total imports of these commodities. Imports of mutton and lamb from Argentina are stabilized (for 1937)

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at approximately the present level of 65 per cent. of the Ottawa year quantity. They may be reduced by 10 per cent. in 1938 and no commitment has been entered into as regards minimum quantities for 1939. Pork imports from Argentina, which have been reduced by about one-third since 1934, will remain at present levels. They represent less than 20 per cent. of total imports of pork and an almost negligible proportion of total supplies on the United Kingdom market.

The Argentine Government agrees in principle to co-operate in the scheme at present in preparation for the regulation of supplies of beef to this market through an International Conference.

As regards other agricultural products, the Agreement consolidates existing duties on wheat in grain and linseed in grain, and guarantees the continued duty-free entry of maize in grain, except flat white maize. Wheat, maize, linseed and wheat offals continue free from quantitative regulation.

The Agreement remains in force until the end of 1939, when it may be terminated at any time subject to six months' notice being given.

On December 15, 1936, the Ways and Means Committee of the House of Commons passed two resolutions imposing on the main categories of foreign beef and veal the maximum duties permissible under the terms of the Agreement. These resolutions became effective from December 16, 1936.

Sooty Blotch of Apples and Plums

THE following note has been communicated by Dr. H. Wormald of the East Malling Research Station, East Malling, Kent:—

As a result of the cold, damp summer, the disease known as Sooty Blotch, caused by the fungus *Gloeodes pomigena*, has been very prevalent this year, and many inquiries concerning it have been received at East Malling. Even some of the fruit exhibited at shows has borne this blemish. During years when the rainfall and sunshine are round about the average there is, as a rule, not enough Sooty Blotch for the grower to give it any special attention, and in hot, dry seasons it is almost or quite unnoticed. For this reason no special precautions are taken by British fruit-growers to prevent it, although the ordinary routine treatment against Apple Scab probably tends to keep the disease in check during a normal season, especially when a late spray or dust is applied.

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Sooty Blotch would appear to be more important in America than in this country, and it has been investigated by a number of workers in the United States, where routine spraying with Bordeaux mixture or lime-sulphur, as used against Scab, is said to be effective against Sooty Blotch also.

The more immediate need of the British grower this year is to know how to treat the gathered crop when it is seriously disfigured by the blotch. The treatment recommended in America is a bleaching method, using the so-called Javelle water which is prepared by heating together, in water, bicarbonate of soda and chloride of lime. A simpler method, using chloride of lime alone, has been evolved by an experimenter in South Africa. Both methods have been tried at East Malling and both have been found to cause a considerable improvement in the appearance of the treated fruit. As there is little to choose between the two treatments with regard to the final result, the simpler method is given here.

Chloride of lime (bleaching powder) is added to water at the rate of $\frac{1}{2}$ lb. to the gallon. The mixture is well stirred and then allowed to settle. It may, if found to be a convenience, be left overnight to settle, for use the next day. The clear liquid is decanted or siphoned off and the sediment discarded. The fruit is immersed in this liquid for one minute. This bleaches the fungus on the blotches and the apples are then washed in clean water and allowed to dry. The method has been tried at East Malling, but only on a small scale, and the most convenient way of dealing with large quantities of fruit has not been determined. A method suggested is to load the fruit into shallow trays, in which it can be immersed in the liquid, taken out, exposed to the air, washed, and allowed to dry before it is removed from the tray.

The fungus penetrates only a little distance into the skin of the fruit and much of the blotch can be removed by wiping the fruit with a damp cloth; this involves the handling of each individual fruit, but it may be found practicable unless large quantities of fruit are to be treated.

Sooty Blotch occurs also on plums, some varieties of which may be so severely blotched as to be most unsightly. This is especially true of green- and yellow-skinned plums such as Warwickshire Drooper and Pershore Egg. Red and purple plums, however, may become infected also, although the blotching is less conspicuous than on the fruit with paler

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skins. The bleaching treatment recommended above has been used at East Malling on plums and found to be successful.

Malting Barley

THE third annual Conference on malting barley held at Rothamsted on December 2, 1936, was a decided success. Farmers had sent in a record number of barley samples, there was a good and representative attendance, and the quality of many of the contributions was very high. Sir Merrik Burrell, Bart., C.B.E., was in the Chair. The primary purpose of the gathering was to enable growers to discuss with expert buyers the reasons underlying the grading of the samples displayed. The barleys, all of which were of malting quality, were graded as follows:—

Grade	A	B	C	D	E	F
No. of samples	7	8	21	54	129	57
Per cent.	2·5	3	7·5	19·5	47	20·5

The proceedings opened with a valuable paper from Mr. H. M. Lancaster, one of the Committee of the Institute of Brewing, who had graded the barleys. It is common knowledge that barleys varying only slightly in external appearance bring very different prices in the market. Some few of them of specially attractive appearance meet such a keen demand in certain quarters that very high prices are obtainable. Whether these fancy barleys are absolutely necessary for the purposes for which they are intended, and whether they produce malts really superior to those from barley of slightly less attractive appearance, Mr. Lancaster was not prepared to say, for there is not at present a scientific standard for the valuation of barley. These specially fine barleys fall into grades A and B of the classification adopted. Following these came a set of sound, well-shaped samples representing the great bulk of barleys bought by brewers; they fall into Grades C, D, and E, their actual position being fixed by small refinements of appearance considered to be important to purchasers. In contrast to those who judge on external characteristics, others, working within the limits of sound, sweet grain, buy on nitrogen percentage, on the basis that grain low in nitrogen is high in carbohydrate and generally yields a sound, "tender" malt. Mr. Lancaster showed that the figures derived from the analyses of the samples shown at the previous Conference confirmed this relationship between grade and nitrogen in

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a general way. There were, however, individual exceptions that needed further examination.

In discussing the results of the grading, the contrast between the grain of 1935 and 1936 was most striking. The year 1935 produced bleached samples containing less than 15 per cent. of moisture, and few of them were really mellow; well-filled grain with thin skin was exceptional. In 1936 it was easy to find plump grain, but the moisture content was high and the "condition" was such that there has been a risk of faulty germination after kiln drying. All were more or less weathered. In spite of this there were on view plenty of samples that with proper treatment would make very good malt. Whether it was necessary to mix such malts with foreign "sun-kissed" barleys in order to keep up the quality of our beers was a question for experimental examination. In their capacity as producers of a high-grade article, however, brewers could not be expected to face the risks involved in trials of this kind.

Members of the Rothamsted staff briefly indicated the general conditions under which the barleys were grown, and pointed out certain apparent relationships between treatment and quality. (1) Autumn sowing or fairly early spring sowing, (2) a soil not too rich in organic residues, and (3) a standing crop, were some of the circumstances that were probably associated with quality above the average.

After inspection of the samples, a general discussion took place. In reply to certain farmers who were concerned about the presence of abnormal ears in their fields of Spratt Archer, Dr. H. Hunter informed the meeting that re-selection of Spratt Archer was now in progress at Cambridge and fresh stocks would be available when they had been thoroughly tested. Farmers should bear in mind that neither Plumage Archer nor Spratt Archer was intended for winter barleys, and those who sowed these varieties in the autumn should do so with their eyes open. Mr. S. F. Armstrong urged growers to demand re-selected seed, as machinery for the supply of this was in existence.

Other interesting points discussed were the artificial drying of barley on the farm; and the possibility of central valuation of barley samples on behalf of growers, so that, armed with knowledge of the quality of their grain, sellers would have a better basis on which to do business.

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Work of the Land Division of the Ministry, 1935

THE recently published Report on the Work of the Land Division of the Ministry for the year 1935 deals with the provision of small holdings and allotments by local authorities under the Small Holdings and Allotments Acts; the administration and finance of the Ministry's farm settlements; the sanction of schemes submitted by landowners in regard to loans under the Improvement of Land Acts; the extinguishment of fines and other manorial incidents attaching to land formerly of copyhold tenure; the control and management of commons; sales and other transactions under the Universities and College Estates Act and the Glebe Lands Act; the appointment of arbitrators in connexion with matters of dispute between landlord and tenant affecting agricultural holdings; and the redemption and apportionment of, and other transactions relating to, tithe rentcharge.

Special reference is made in the Report to the activities of the Commissioner for the Special Areas in undertaking, in co-operation with the Land Settlement Association, the Welsh Land Settlement Society and certain local authorities, the settlement of unemployed men on the land.

Apple Consumption in Relation to Population

IN the course of an address to the British Empire League on November 17, Mr. H. V. Taylor, Horticulture Commissioner to the Ministry, said that imports of apples into the United Kingdom increased from 3,028,000 cwt. in 1904 to 7,272,000 cwt. in 1935. This increase was connected with a rise in the population and in the general standard of living.

Until recently British growers failed to apply commercial standards to orcharding and marketing, with the result that the public preferred the imported fruit and acquired a taste for apples of low acidity and mild flavour, grown abroad, in preference to the more acid and high-flavoured types formerly favoured in this country. One result of this was that dessert apples of low acidity were now being planted in British orchards. In 1931 (the last year in which apples were admitted free of import duty) 58·5 per cent. of the imported apples were of foreign origin. The effect of the duty on foreign imports was to reduce this percentage, by increasing the duty-free Empire imports to 76 per cent. of the total in 1934. It is noteworthy, however, that the total imports remained approximately the same in 1935 as in 1931.

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Statisticians were predicting a decline in the home population, and this must inevitably involve a decline in the demand for apples if the present rate of consumption could not be increased. Medical opinion favoured the inclusion of more fruit in the diet, and, partly in response to propaganda, the per capita consumption rate of apples increased from 23 lb. in 1924 to 32.5 lb. in 1934. An even greater rate of increase would be necessary to counteract the effects of a possible fall in the population.

The home industry was being stimulated by the establishment of fruit research stations. A Cider Research Station established at Long Ashton in 1901 was enlarged in 1913 to become a Fruit Research Station, and in the following year a second Station was founded at East Malling. In 1928 National grades were defined by legislative action, and a National Mark scheme for apples was inaugurated. The scheme is voluntary, but already the apples sold under its provisions form a large volume.

In 1874 the area of orchards of all kinds in Great Britain was 148,221 acres. In 1931 the area in England and Wales amounted to 244,778 acres, and this had expanded by 1935 to 262,115 acres, an increase of over 17,000 acres in four years. Research had disproved the opinion, formerly widely entertained, that the home climate was less favourable for apple production than that of the United States and certain Empire countries. It had been demonstrated that the climate was less at fault than the methods adopted, and that by spraying and manuring good crops could be produced. New planting of popular varieties had been made, and packing stations equipped with grading machinery were now common in most fruit districts.

The effects of these methods were evident in the increased consumption of home-grown apples. In 1924 only 25 per cent. of the apples consumed in the United Kingdom were grown there, while 27 per cent. were supplied from Empire countries and 38 from the United States of America. Ten years later 57 per cent. were supplied from Empire sources and 11 per cent. from foreign countries. These facts, Mr. Taylor submitted, would serve to emphasize the value of intensive propaganda and efficient organization, and he suggested that if such progress continued, before long, home orchards would be supplying a much larger proportion of the requirements of the home market.

AERIAL PHOTOGRAPHS OF RURAL AREAS

RAY BOURNE, M.A.,

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THE air photographs taken for the revision of Ordnance Survey maps are on a scale, approximately, of 1:5000, or $12\frac{1}{2}$ in. to the mile. Being photographic representations of the earth's surface, they depict a mass of detail, such as hedgerow trees, ricks, cattle tracks, rabbit burrows, etc., none of which are recorded on line maps.

All such features can be recognized on the photographs for what they are. Other features, though they are distinctly recorded, cannot be explained without examination of the photographs on the ground they portray. The photographs, however, through the bird's-eye view they afford, draw attention to them and invite investigation in the field. Without the photographs they would often pass unobserved by the man on the ground.

When used as maps, the photographs are easily read. Even farm labourers, to many of whom a line map conveys little, will quickly learn to orientate air photographs of land they know, and recognize many of the surface features depicted. Exactly what features the photographs show, depends to some extent on the season of photography.

From several points of view, photography in late winter or early spring is of special interest. For instance, a spell of weather suitable for photography often occurs in March, when the surface soil is exposed to view in the majority of arable fields. Fields sown in autumn, though green to the eye from ground level, photograph from 10,000 feet almost as if there were no crop at all. Yet areas on which the crop is advanced, on account of early sowing, good treatment, or favourable soil temperatures, can be distinguished from those on which it is late. Further, wet or heavy soils, by reflecting the light, photograph differently from dry or light soils. If suitable filters are used, the colours of soils are also differentiated as shades from white to grey.

At this time of the year, also, the differences in the soils show up more clearly in the pastures than at any other season. The differences in the soils under grass, of course, can only

AERIAL PHOTOGRAPHS OF RURAL AREAS

be judged indirectly by such features as the appearance of the grass, the breadth of lands or the seepage of water on the surface. Obviously, when interpreting the phenomena shown on the photographs, due allowance must be made for the effects of winter grazing, which, however, are generally plainly to be recognized. Grass land areas that have been dunged or limed are also clearly distinguished. Indeed, the condition of both pastures and temporary leys is easily assessed on photographs taken at this season.

Again, the state of hedges, hedgerow ditches and surface drains is revealed better at this time than at any other. When there are underwoods, their density and relative ages can also be estimated, while the shadows cast by the standards permit of their number being determined and roughly classified by sizes.

With photography later in spring, following the early growth of corn and the flush of new grass, the differences in the appearance of the cornfields and the pastures closed for hay are relatively small. Nevertheless, advanced growth is easily distinguished from tardy growth, a phenomenon that is emphasized in the event of an early summer drought. In that eventuality, any nitrogen deficiency in the land is clearly shown by the differential colouring of the vegetation. In the case of the fields open to pasture, selective grazing, the distribution of which is accurately recorded on the photographs, generally points to the areas with the most palatable grass mixtures. As regards woodlands, it is at this time of the year that the different tree species can be most easily distinguished by the varying shades of their foliage.

When photographs are taken between the hay and the corn harvest, the best record is obtained of the cropping. At this time it is generally possible to locate direct from the photographs, the hayfields, meadows, drier pastures and rough grazings, the temporary leys, cornfields, and potato, root, etc., crops.

As regards arable fields, the cleanliness of the crops and the effects of past cropping, dunging and manuring can generally be seen. Where cross-ploughing has been employed, this is very evident. On the lighter soils it is often possible to tell almost to a yard, where sheep have been folded and where not. The relative heaviness and evenness with which farm-yard manure has been added, can usually be judged. Attention may be drawn by the photographs to crops suffering

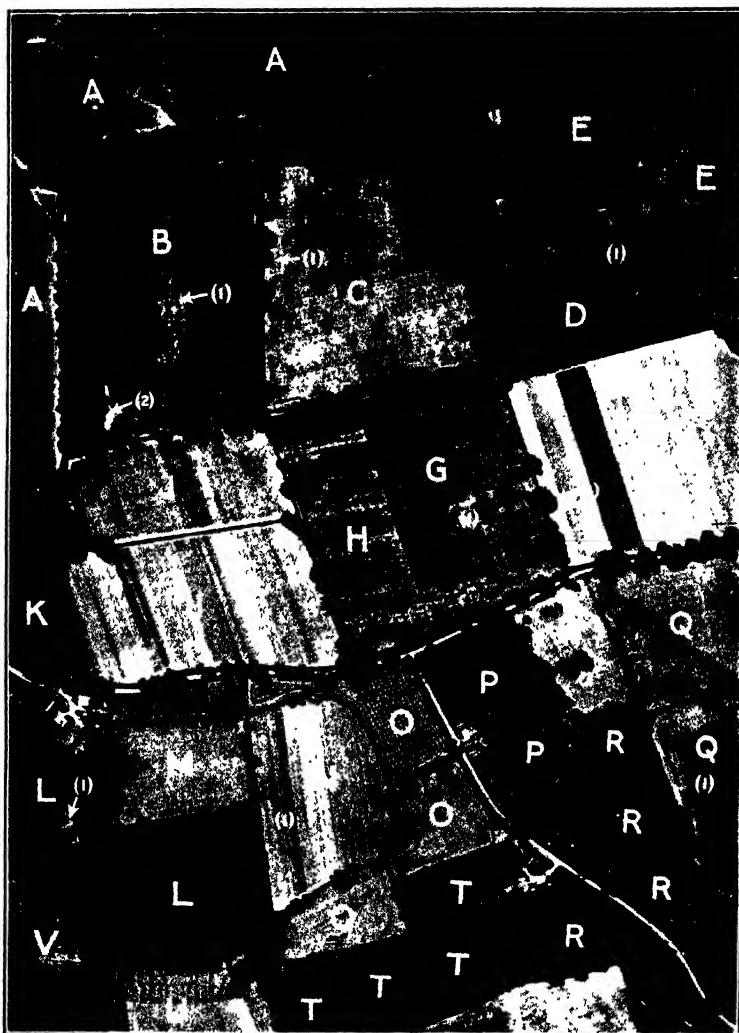


FIG. 1

- A Permanent grass with many weeds
- B Red chaff wheat. Note (1) dirty patch, (2) area damaged by shade and, in general, differential growth according to previous cropping
- C White chaff wheat. Note (1) damage by shade
- D Oats. Note (1) dark spots indicating better growth where dung has been heaped prior to spreading
- E Permanent grass reduced to *Festuca* sward by rabbits
- F Roots, etc. Note, (1) damage by shade.
- G Oats. Note: (1) dirty patch
- H Old stubble unploughed. Note differential growth of grass according to previous cropping.
- I Potatoes
- J Roots, etc. Note, (1) damage by shade

Photo—Aeroflms, Ltd.

- K Wheat on land recently folded for sheep. Note traces of penning
- L Permanent grass in fair condition. Note (1) Poaching of the ground where feeding has been undertaken.
- M Hayfield already harvested.
- N Roots, etc., and (1) potatoes
- O Hayfields in process of harvesting
- P Closed for hay, but left uncut. Grazing commenced
- Q Hayfields already harvested. Note (1) old lands
- R Closed for hay, but left uncut. Note the lands
- S White chaff wheat, full of weeds and much damaged by pheasants
- T Permanent grass in fair condition
- U Hayfield in process of harvesting
- V Oats. Note (1) dirty patches

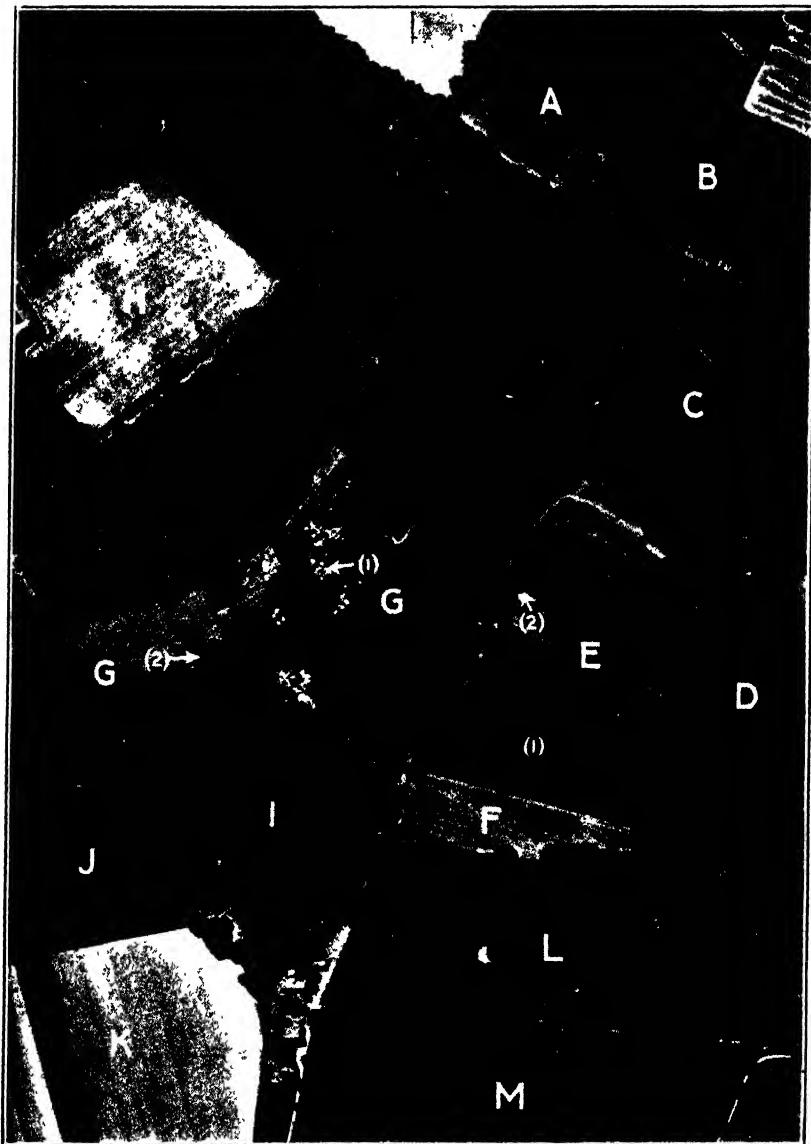


FIG. 2

Photo—Aerofilms, Ltd.

- A Tumbled down to grass
- B New plantation
- C Meadow with much rush growth and a few open drains partly cleared
- D New permanent grass (very thin)
- E Oats. Note differential effects of previous cropping, including (1) folding with sheep. Also note (2) damage by shade
- F Roots, or forage crop
- G Permanent grass, almost reduced to Fescue sward by rabbits. Note (1) rabbit warrens.
- H White chaff wheat; a dirty crop, much damaged by pheasants
- I Permanent grass with many weeds
- J Oats. Note dark spots indicating better growth where dung has been heaped prior to spreading
- K Roots, etc.
- L Permanent grass in fair condition
- M Clover ley. Note differential effects of previous cropping and treatment (1) rabbit warrens.

AERIAL PHOTOGRAPHS OF RURAL AREAS

from potash or phosphate deficiency. Likewise, differences in crops may point to the previous heavy demands made on the soil by such crops as peas and maize.

In the cornfields generally, oats can usually be distinguished from wheat or barley; early crops from late; and differences in soil moisture are often indicated by differential growth or ripening of the corn. The actual areas damaged by rabbits or game, or in which the growth has been stunted by the shade of hedgerow trees, can always be recognized and their extent measured.

In grass land, apart from the clear-cut distinction between hayfields, meadows, drier pastures and rough grazings, it is generally possible to gauge the incidence of grazing, the frequency of weeds, the extent of rabbit damage and the general condition of the herbage. In the event of a drought, it is at this time, or even later in the year, that the presence or absence of underground drains in grass land is clearly revealed.

With photography in autumn, less is to be learnt from air photographs than at any of the other seasons mentioned. There is less differentiation in the grass land than at any other time. Again, stubble in the cornfields not only appears very similar, whatever the previous crop, but is a very effective blanket over the soil. The clover leys alone are distinct. As ploughing and treatment of grass land proceeds, however, the surface features approximate more and more to those met with in late winter or early spring.

This brief and general description of the seasonal aspects of the land surface, as seen from the air and depicted on air photographs, will perhaps give some idea of the uses to which they may be put by the agricultural community. Landlords, agents, tenants, owner-occupiers, county organizers, soil surveyors, and research workers, should be able to envisage the several ways in which, individually, they could profitably use air photographs of the land in which they are interested.

THE RABBIT IN AUSTRALIA: SOME SUGGESTED METHODS OF DESTRUCTION

GEORGE BERRIE

As rabbits have become a problem in Britain a brief outline of Australian legislation for their compulsory destruction, and of the methods applied, may be of interest and practical value to those who ask for similar action here. What rabbits have cost Australia in capital expenditure and ruined country cannot be calculated. Their complete extermination seems to be impossible, but in many districts drastic action and unceasing vigilance keep them to a minimum. With the aid of a healthy climate they breed alarmingly, have few diseases and can ignore natural enemies. Although they return a certain amount of revenue to the country from the export of skins and carcasses, they are regarded as vermin. It is even illegal to keep a rabbit as a pet!

The State of New South Wales is divided into districts, each of which elects a local body known as the Pastures Protection Board, and part of whose duties is to administer the laws relating to the destruction of noxious animals. The Board's revenue is derived from annual assessments on the live stock in its district, the rate-payers alone are the electors, and the members are invariably representative stockowners or farmers. Their position is honorary. The Boards also administer the Act, providing landowners with wire netting on extended terms at low interest rates.

When a district is declared rabbit-infested—and there are few districts that are not—the controlling Board appoints a rabbit inspector. The inspector travels continuously over his area, which may cover thousands of square miles, and if he finds that landholders—large or small—are not keeping their rabbits in reasonable check, they are served with notices to do so. If on a further inspection, say, in three months time, it is found that the notice to destroy has been ignored, the delinquent landholder is summoned and fined unless he has some reasonable excuse. The maximum penalty is £100 (one hundred pounds), and the Boards do not hesitate to take drastic action when necessary.

In favoured districts, where settlement is small and land of high value, landowners seldom need spurring to action, but

METHODS OF RABBIT DESTRUCTION: AUSTRALIAN SUGGESTIONS

in poorer localities—particularly where there are large areas of unoccupied lands, usually of inferior quality—the problem of the invading rabbit is very acute. Consequently, the first step taken by any landholder who means to tackle it seriously is to fence his boundaries with rabbit-proof netting.

A standard rabbit-proof boundary fence would be as follows. Stout wooden posts—split for choice—sunk 22 in. in rammed ground and standing 46 in. out, are placed 11 ft. apart. Four plain steel galvanized wires—the first three at 12-in. intervals from the ground—are run through holes bored in the posts, and one barbed wire is placed on top. The netting is trenched 6 in. in the ground, and stands 3 ft. out of it. Its mesh is 1 $\frac{1}{4}$ in., its gauge No. 17, and it is heavily galvanized. This is an expensive fence to erect, but apart from its being a necessary barrier to rabbits, it makes an absolutely stock-proof boundary. Few landowners would care to be without one, even if there were no rabbits.

What it may cost to get the last rabbit from a badly infested holding may be illustrated by an instance within the writer's experience. The station in question was one of 40,000 acres. It had been badly neglected, its netted boundaries allowed to fall into disrepair, and its whole area was literally swarming with rabbits and riddled with warrens. A new manager was given instructions by the owners to clean the place up—no matter what it cost. He put the boundaries in order, and subdivided the area into four rabbit-proof blocks. All fallen timber was stacked and burnt, every hollow tree, green or dry, came down. The warrens were dug out, ploughed out, and in the case of rocky outcrops, concreted in. Many thousands of rabbits were destroyed in the process, and the final stage was the employment of gangs of men with mobs of dogs. They harried the homeless rabbits until they actually did get the last one of a number impossible to estimate. The total cost to the station was a little short of £10,000 (5s. per acre), but either the rabbits or the sheep had to go. The amount was soon recouped from the increased stock-carrying capacity of the land; and once it was cured of "rabbit sickness," certain specially fattening herbage soon reappeared.

The general methods of destruction—short of systematic digging-out—are trapping, bait poisoning and gassing. When skins or carcasses are high in price, trapping will reduce numbers considerably, but the trapper naturally leaves sufficient rabbits to breed up, and—setting his spring-traps at

METHODS OF RABBIT DESTRUCTION: AUSTRALIAN SUGGESTIONS

buckheaps, as he does—he encourages breeding by destroying more males than females. Poisoned baits have wiped out uncounted millions. For years pollard was favoured, but it took a serious toll of bird life, and is seldom used to-day. It was distributed into a small ploughed furrow from a specially designed horse-drawn vehicle. Poisoned jam—quince for choice—and thistle roots are particularly effective, with the added advantage that, except by accident, nothing but rabbits will touch them. Gassing is now universal, and the types of machines used are numerous. They vary from small hand-operated affairs that can be carried about, to power-driven plant carted on a lorry. One common feature to them all is the pumping of ordinary black smoke into the warrens before they are closed up for gas poison. Small holes or ground cracks that might easily be missed are thus quickly disclosed. The Australian farmer rarely gets any return from rabbits, nor does he look for it. He is usually only concerned with getting rid of them.

It is very unlikely that any such system of compulsory destruction will ever come into force in Britain. The use of netting seems impracticable except for special areas. Bait poisoning is—for obvious reasons—out of the question. Gassing has been successfully tried, but as a method it has the drawback that the carcasses are lost; while trapping seems to be dependent on the price of carcasses, and is badly handicapped in a severe winter. The British farmer, who looks to rabbits to give him some sport occasionally, must so restrict their numbers that they do not become a nuisance.

Two methods of wholesale trapping that are successfully followed in Australia should be equally effective here, and at small cost. They would enable a farmer to keep his own rabbits—and particularly those invading him from a neighbouring farm—to a minimum, and yet make a small dividend from them even when the price of carcasses is low. One is a netting yard, the other a pit trap.

The netting yard (Fig. 1) would probably be most effective where rabbits are coming from some congested cover such as a small wood or railway embankment. The site for the yard is selected in a central position on the edge of the cover, and its size will depend on the number of rabbits likely to be trapped in a single night—say 15-ft. square. It needs to be very strongly built with posts and stout-gauge netting let 6 in. into the ground, and its height should not be

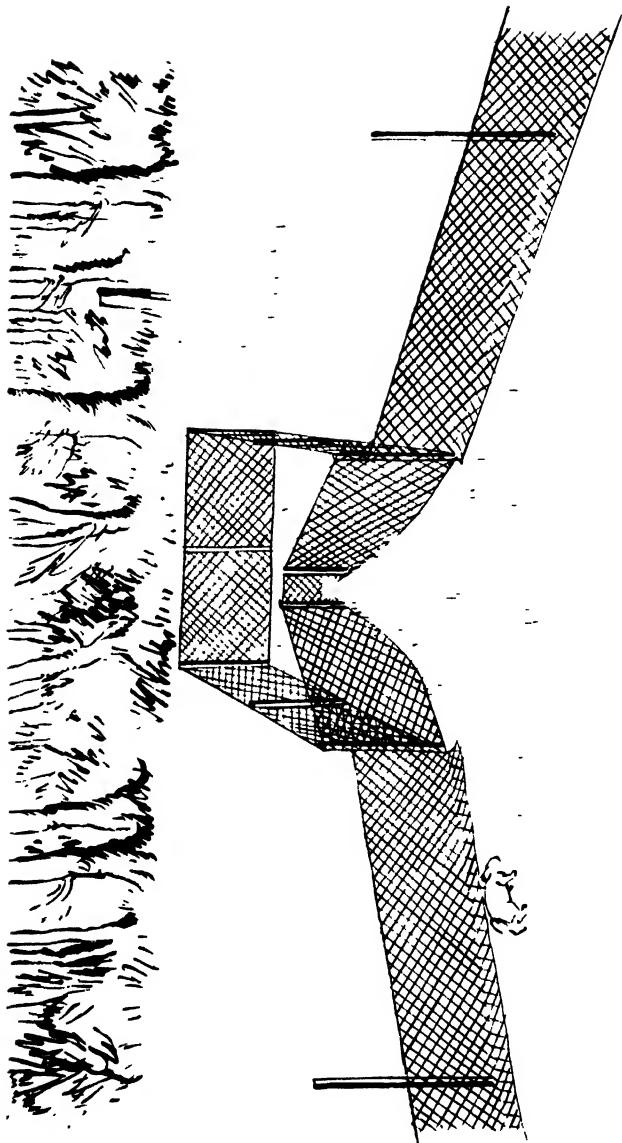


Fig. 1. Setting wire for catching rabbits. (See page 934.)

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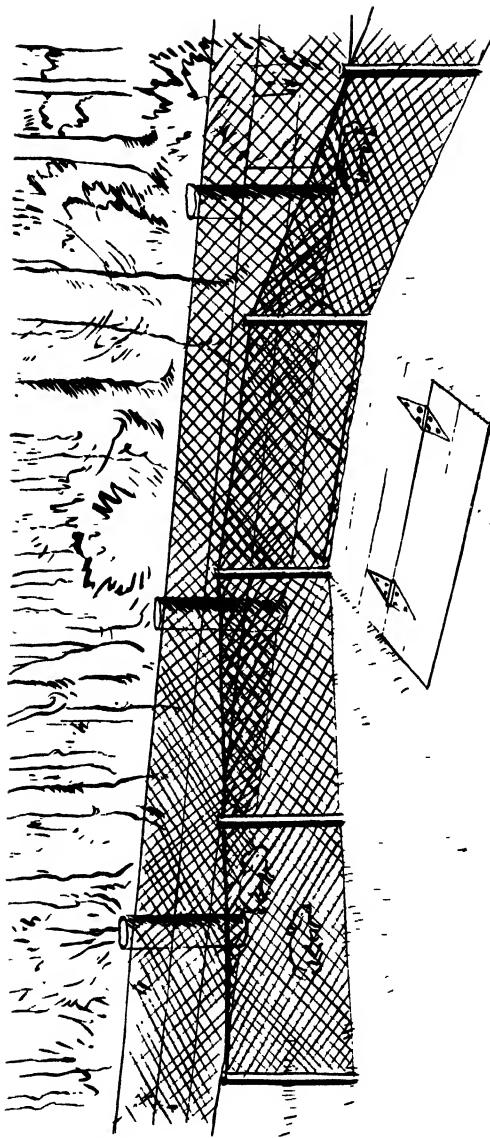


Fig. 2 — Australon form of pot trap for catching rabbits (see Fig. 935)

METHODS OF RABBIT DESTRUCTION: AUSTRALIAN SUGGESTIONS

less than 5 ft. above ground. Facing *outwards*, to meet the homecoming rabbits, a V-shaped entrance is made into the yard, finishing between posts sufficiently far apart to allow a rabbit to pass comfortably. The ground immediately approaching the entry point is turfed up gradually to a height of about 12 in., and, an inch or so above it, one mesh of the netting is cut and the prongs are turned inwards into the yard. The rabbits, when inside, are well below the entrance, and are moving round a sharp corner. If one does find its way out, it is a lucky fluke.

The rabbits are persuaded into the yard in the following way. From each corner of the V entrance, and running at a sharp angle to the rabbits' line of approach to their feeding ground, a row of light pegs is erected, and the distance is governed by the area of the cover. It might be a couple of hundred yards on either side. On the pegs—which can be placed, say, half-a-chain apart—light-gauge netting is hung so that it will lap a few inches on the ground. Until after nightfall, the netting is left tied up to allow feeding rabbits to pass easily underneath on their outward journey, and some time during the night it is released. The rabbits on returning towards their cover find the netting barricading their path and as its angle is guiding them more or less homewards, they follow it until they come to the V entrance to the yard. Unless British rabbits differ very vitally from their Australian relatives, they will find their way in. Should there be an old netting-fence, and the rabbits coming through holes or broken meshes, it may be used instead of the temporary wings merely by facing *two* V entrances *along* the fence instead of *outwards* and blocking up the holes at any time after dark.

It will be noted that no attempt is made to *drive* the rabbits into the yard. The whole theory is to persuade them into it in the expectation of getting home. The cost of the netting required is not high, and if carefully handled could be used for years. The yard can either be made a permanency, or in sections hinged or hooked together to enable it to be moved from place to place.

In Australia, the pit trap (Fig. 2) is usually placed on a netting fence that rabbits often follow in waves—looking for fresh pastures. The size of the pit varies, but 3 ft. is deep enough, and the sides may be timbered if necessary. The top is covered partly by a lift door, but *against* the netting

METHODS OF RABBIT DESTRUCTION: AUSTRALIAN SUGGESTIONS

fence there is a narrow runway sufficiently wide to allow a rabbit to pass along comfortably. At both ends of the runway there is a balanced board, bedded level at the entrance. These boards are so weighted that as soon as the rabbit passes the centre it is tipped into the pit. The rabbits are guided on to the runway by means of short netting wings at a sharp angle from each end.

Here, pit traps could be placed on existing netting fences out of repair, or on temporarily-constructed wings. In either case, the procedure would be the same as with the netting yards. There is no exaggeration in the writer stating that he has seen large pits so full of smothered rabbits that the drop boards could not work.

THE RELATION OF THE FARM INSTITUTE TO LIFE IN NORWAY

A. V. CAMPBELL,

Ministry of Agriculture and Fisheries.

LACK of water in a Norwegian salmon river caused the writer to interrupt a fishing holiday and turn his attention momentarily to agriculture by way of a visit to the Jordbrukskule, or Farm Institute, at Mo near Førde in Sojnfjord.

Førde is situated on the west coast of Norway some 70 miles north of Bergen, and set back some 30 miles from the open sea at the end of Vevring Fjord at a latitude slightly north of the Shetland Islands. It is an area of long shadows, and, during the summer, light nights, and enjoys a not unpleasant climate. Spring here lags behind the English spring by about a month, while during the winter, snow, although not deep in the valleys, puts an end to many outdoor activities. These two factors, as would be expected, largely determine farm practice.

The countryside may be pictured as a series of narrow valleys, many of which are about a mile wide, at the foot of mountains covered up to the snow line with conifers and silver birch, while rough grazing exists in the more open spaces. In the numerous valleys, small farms with picturesque wooden buildings are dotted about.

As regards food, the standard of living is high, and the first concern of life under such conditions is to maintain an adequate supply. Other bodily requirements, such as clothes, etc., come mainly from the exchange of timber and dairy products. Hence, after farming come woodcraft, sawing, lumbering and carpentry as questions of the first importance, since it is by the exchange of sawn timber and fish boxes, which are made in quantity, that the additional requirements of life are obtained. Recently silver-fox farming has been added to those occupations.

The cultivable area that constitutes a farm is usually small, and the care that is bestowed on this indicates the pressing nature of the land hunger that exists. Added to the cultivated fields are areas of high ground in which the occupier, who is

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usually the owner, has the right of tree felling. These highland areas, which are called "seters," are usually unfenced, and while the right of tree cutting is personal to the owner on his particular holding, grazing rights are owned collectively by adjacent farmers. The natural soil is in many parts often a series of extremes, being either of a sandy nature or pure peat, while old settlements have usually been made by years of consolidation, manuring and mixing of the extreme types in much the same manner as one would marl land in England. The winning of a livelihood under such conditions, however, appears to be no easy task, and, although certain compensations in the form of cheap power, light and telephonic communication, are available, the scattered nature of holdings calls for resourcefulness and thrift. Content as implied by English standards does not in Norway appear to be measured altogether in terms of bank balances.

A good and plentiful supply of certain types of home-produced food is obtained from both land and water, while that not required for immediate consumption is, when possible, preserved for winter use. So finely is the balance held that little money is available for luxuries.

It is small wonder, therefore, that the teaching at the Farm Institute at Mo is designed not only with the idea of stimulating thought and creating interest in a life that may become somewhat solitary were it not for the telephone, with which almost every holding is equipped, but also to give a very thorough technical training in all branches of rural economy and crafts—a training which would, indeed, have delighted Cobbett.

The Farm Institute at Mo consists of hostel (Fig. 1), farm buildings (Fig. 2) and dairy, made, as would be expected, of wood standing on a substantial concrete footing, which provides also for a basement with a frost-proof chamber. The school has been in existence some 80 years. It is situated on its own land, bordered on one side by a mountain range and on the other by a river into which a waterfall some 300 ft. high pours incessantly, except during the winter months, when the feeding lake becomes icebound. The low-lying land is mainly peat, while the higher ground is often light and sandy. The area under grass is about 20 acres, while another 16 acres are under rotation. In addition there is a fairly large area of woodland that provides scanty grazing.

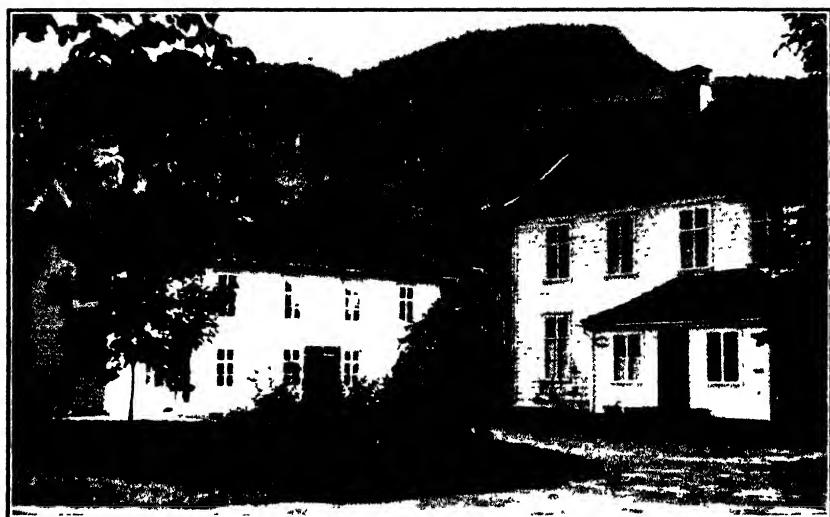
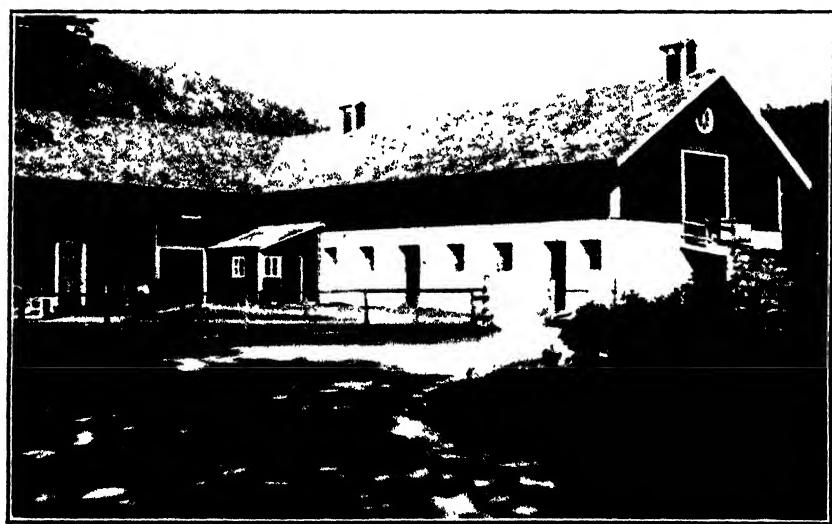


FIG. 1 Hostel and lecture rooms at the Farm Institute, Mo, Førde, Sognfjord, Norway



Photos A. V. Campbell

FIG. 2 Farm Buildings at the Farm Institute, Mo, Førde, Norway. The cow byres are on the ground floor, with hay loft and food store over. It is possible to drive a horse and cart through the loft, which is reached by the ramp seen on the right of the view

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FIG. 3.—The dairy herd at Mo, Forde, Norway. In the background can be seen the spray rising from the Fairy Falls.



Photos A.V. Campbell
FIG. 4. The dairy herd is composed of small animals not unlike our Shetland Island breed. Note the wire fencing (in the middle distance) separating the grass plots, which are grazed rotationally.



Photo Miss A. Spencer.
FIG. 7.—Hay drying on racks,
Norway.

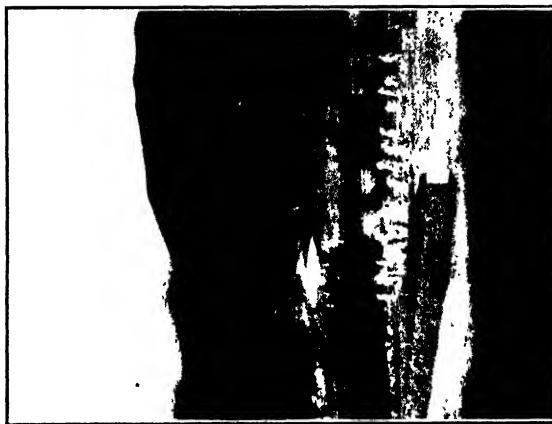


Photo F. Davis.
FIG. 6.—Potatoes in the foreground, hay
drying on fences, and stacks of oats

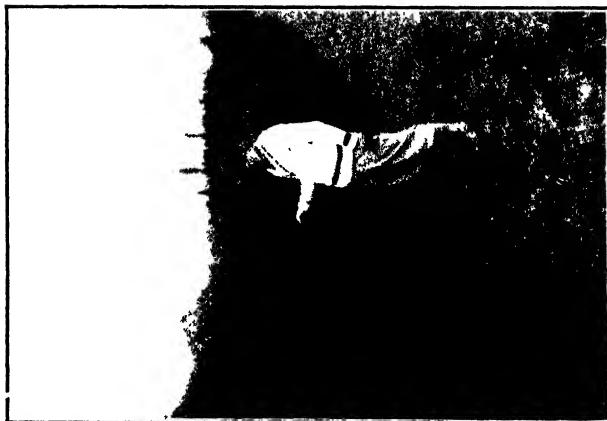


Photo S. Fisk
FIG. 5.—Method of drying grass by
hanging on wire fence, Norway.

RELATION OF THE FARM INSTITUTE TO LIFE IN NORWAY

Twenty-eight cows of the Vestland Fiord type are kept. These are small beasts not unlike the Shetland Island breed (Figs. 3 and 4). All are carefully recorded and rationed; in addition the herd is kept free from tuberculosis. The average milk yield is roughly 550 gal., while the best examples of the breed approach 875 gal.

Sixty sheep of a Cheviot cross type, 3 horses and a number of pigs of Large White type complete the live stock, with the addition of a few goats and a small head of poultry. At first sight, having in mind the amount of rough grazing available, one wonders why the sheep population of the nearby countryside is not larger, but the answer is found in the difficulty of providing winter keep, for all sheep must be housed and hand fed, owing to their inability to live out of doors during the period of winter snow. Surplus milk from the dairy herd, after providing for local requirements or for teaching purposes in butter and cheesemaking classes, is consigned to the Dairy at Førde, from which centre it is issued or made into butter or cheese, of which large quantities are consumed.

It is not to be wondered at that, as farm-grown foodstuffs are so valuable by reason of the lack of land, every device is used to obtain the maximum output in its most palatable form. Economy has determined that rotational grazing of the pastures that contain much timothy and wild white clover should be practised. Considering that the low-lying pasture land is pure peat, the texture of the sward and the bite it affords is surprising. Both hay and silage are made by the ordinary and A.I.V. processes. The hay crop is of particular interest in view of the point that is being made in England at the moment that young grass provides the best food. Whereas for economic reasons mechanical drying would probably not be possible in this part of Norway, the same result is obtained by the accepted plan of making two cuttings in the young stage, the hay being dried on light wire fences that intersect the fields (Figs. 5 and 6). Most of the hay so taken is rotational, the practice being to leave the lay down 3 to 4 years, taking turnips, potatoes and oats as the other crops in the rotation.

In addition a small area is allotted to vegetable and fruit crops. Apples are at the moment receiving increased attention and trials with malling stocks show that grafts on 9 and 2 stocks may prove an asset to the countryside. A small glasshouse has recently been erected. This is heated by

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electricity, the cost of which is low when compared with English charges.

The staff consists of a Director and an Assistant Director, who divide the work of teaching both practical agriculture and imparting some knowledge of the underlying sciences. In addition, another member of the staff deals with garden produce both in its outdoor and indoor aspects. Foremen-instructors supervise other technical subjects, for it is highly necessary that students should have a thorough training in wood and metal craft, in view of the fact that in after life they may be called upon to fashion or mend any of the implements which they may require.

Before admission to the college, students must have attained the age of 18 years and have reached a good standard of education in the junior schools. Payment for accommodation and instruction is 1s. per day, the balance of finance being found out of farm profits, Government and communal aid. Students undertake practically all the work on the land as a part of their instruction and are also given instruction in animal management, dairying, etc. Accommodation is provided for 60 students, who take a two-year course that lasts from October to April each session. The condition of farm life demands that the teaching at the college should be related to the practical requirements of the life, although the academic side, which includes literature, is by no means neglected. The fundamental aim is to equip a young man with knowledge that will enable him to emulate Robinson Crusoe if necessary, and, starting with power and timber, to fashion not only a farm, but the house he will live in and the many incidental requirements. Lumbering, sawing, including the setting up of the mill, the harnessing of electricity delivered to him, making of wheels, chains, building, etc., all form part of instruction in handwork.

THE ASPARAGUS FLY

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The Asparagus Fly (*Platyparea pœciloptera* Schr.) is a native of Central and Southern Europe, but appears to be spreading slowly westward. About the beginning of the present century it was found in the neighbourhood of Paris and it has since become a serious pest in the valley of the Seine, where asparagus is largely cultivated. In 1931 it was first reported from Holland. So long ago as 1904, the (then) Board of Agriculture issued a leaflet on the insect and this has led to the assumption that the pest had been observed in England. There seem, however, to have been no grounds for this supposition, and, in point of fact, the insect was not known in this country until 1935, when an asparagus bed in a private garden in Hertford was found to be heavily attacked. Subsequently, numerous instances of infestation have been found in gardens in South Hertfordshire.

The Asparagus Fly is a member of the family Trypetidæ or Fruit Flies, which is most strongly represented in warm climates, and includes, abroad, such well-known pests as the Apple and Cherry Fruit Flies and the Mediterranean Fruit Fly, and, in Britain, the Celery Fly.

So far as is known, asparagus is the only cultivated plant attacked by the fly, and this is injured by the larvae (or grubs) which tunnel in the stems (Fig. 4). The loss resulting from the attacks is two-fold: first, there is that due to actual distortion or killing of the early shoots which would otherwise be cut for the table, and secondly, the effect of the attack on the later growth which is normally left to develop naturally. In this country, owing to the comparatively late emergence of the flies, the first source of loss would seem likely to be of little importance: cutting has largely ceased before the attack commences. The attack on the later growth, however, may be very serious: the crowns will be increasingly weakened year by year and an attacked bed will sooner or later become unproductive.

The adult Asparagus Fly (Fig. 1) is similar in general appearance to the well-known Celery Fly, but is slightly larger, and the black markings on the wings are more

THE ASPARAGUS FLY

extensive. On the Continent of Europe, the flies begin to emerge towards the end of April and continue to appear until mid-June. Under English conditions, however, emergence is apparently later; in 1936, it started in early June and continued until mid-July.

In dull weather, the flies are sluggish and can be seen resting on the plants or walking slowly over them, moving their wings up and down. On bright, warm days, they become more active, flying readily, but only for short distances. Pairing takes place soon after emergence and egg-laying is begun a few days later. The eggs, which are white and oval in shape, are inserted singly in the asparagus stems just below the skin, usually near the growing point, or, when older stems are attacked, in the neighbourhood of the "leaves." In a few days these eggs hatch, giving rise to tiny white cylindrical-shaped maggots, which tunnel down the stems, feeding on the tissues; several of these grubs may be found in a single stem. When young shoots are attacked, the feeding of the grubs causes them to twist and become distorted: they remain dwarfed and usually die before producing "leaves." With older stems, little distortion is produced, but such stems die off earlier than healthy ones, and may be recognized in late summer by their premature yellowing (Fig. 5).

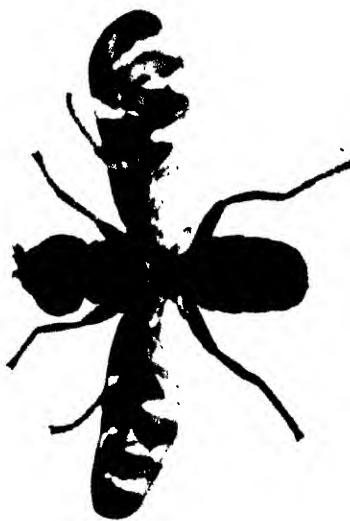
In about three weeks to a month the grubs (Fig. 2) are fully fed and they are then about $\frac{1}{2}$ in. long and yellowish white in colour: the front segments are slightly tapered with two mouth hooks, while the posterior end is flattened, dark brown, and provided with a small forked process.

Pupation takes place in the stem, usually near or just below ground level. The puparium (Fig. 3) is barrel-shaped, about $\frac{1}{2}$ in. in length, and is slightly flattened on one side, with a short anchor-like process at the hinder end. The colour is light brown at first, becoming darker later.

As mentioned above, attacked stems die off prematurely: they are also weakened by the larval tunnels and frequently break off at or about soil level. The underground part of the stem then rapidly decays and the pupae fall into the soil, where they remain during the winter.

The flies do not emerge from the puparia until the following spring, there being but one generation in the year. Owing, however, to the lengthy period during which the flies are on the wing, newly-hatched larvae and pupae may be found at the same time, and even in the same stem.

Fig. 2 (top) Larva in stem
Fig. 3 (bottom) Pupa



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Fig. 5. Effect of shear rate distortion of 50%
on the shear modulus of polyisobutylene

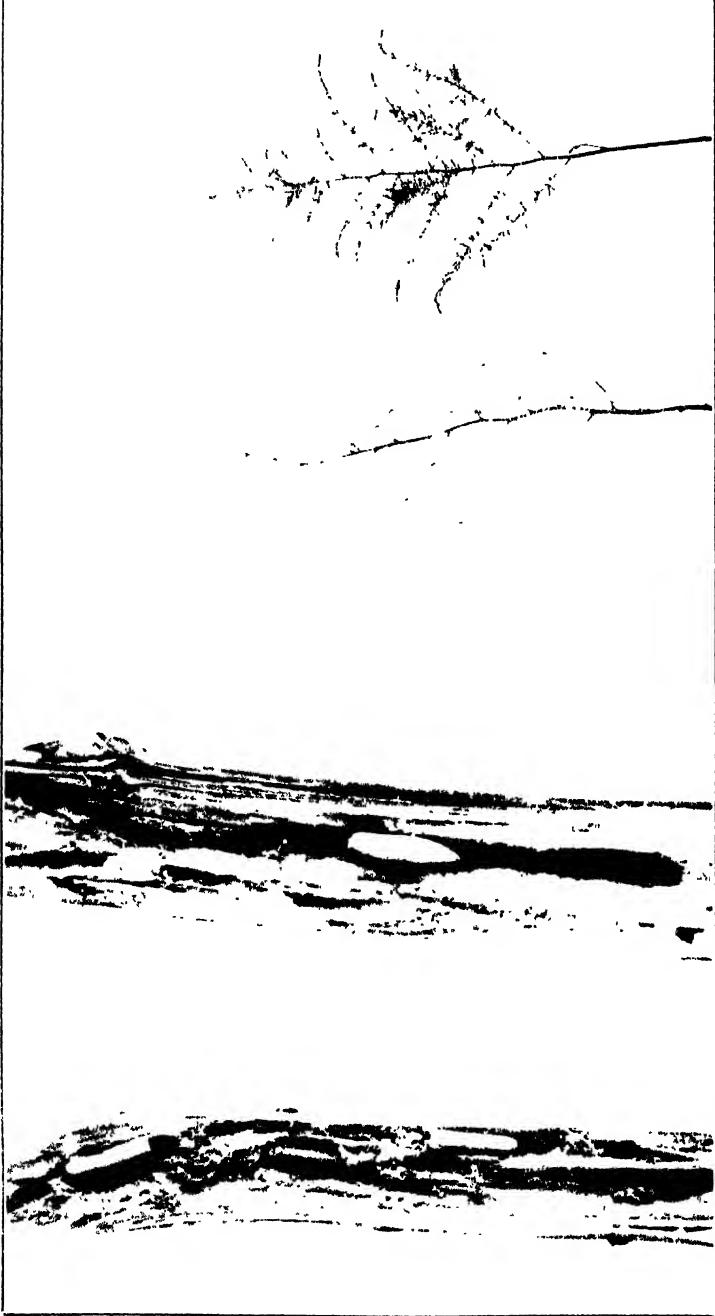


Fig. 4. Fracture morphology of polyisobutylene

THE ASPARAGUS FLY

Various control measures against the pest have been tried on the Continent, but none has proved entirely successful. The recommendation most generally adopted is to cut and burn the stems as early as possible in autumn. By this means, large numbers of the pupae will be destroyed; but, on the other hand, many will be left in the underground portions of the stems and in the soil, and at best the infestation will only be reduced to a greater or lesser extent. Measures to kill the adult flies before they have laid their eggs have been suggested; these include spraying with nicotine, baiting with poisoned sugar solution and trapping by means of sticks, roughly shaped to resemble asparagus heads and covered with sticky material. Only the last of these methods has proved in any way effective, and only a partial reduction is obtained in this way. Spraying is not economically possible, owing to the protracted flight period of the flies, and they are not attracted to any form of sweetened bait that has been tried. It has been found that the flies are unwilling to lay eggs on asparagus that is surrounded by higher vegetation; and, in some instances, attacks have been considerably reduced by interplanting the rows of asparagus with cereals.

As none of the above measures appear to offer a satisfactory control of the pest under English conditions, experiments are now being carried out with a view to obtaining a soil insecticide that will destroy the overwintering pupae. On a small scale, an emulsion of carbon disulphide has given promising results, but no definite recommendations can be made at present. Destruction of the affected asparagus does not, unfortunately, result in the eradication of the pest, since there is no time of the year in which there are not puparia in the soil. When a bed has become so unproductive that it has to be done away with, the best time to dig it up is about the first week in July, when the plants should be removed and burned. Asparagus should not be replanted on the same site or in the immediate vicinity for at least a year.

On beds that still produce a reasonable crop, the only measures that can be suggested at the present time are:—

1. To remove and destroy any distorted stems during the growing season.
2. To cut and burn the stems as early as possible in the autumn, taking care that they are cut as near the crown as possible.

EIGHTEENTH-CENTURY CROP HUSBANDRY IN HERTFORD AND MIDDLESEX

G. E. FUSSELL,
Ministry of Agriculture and Fisheries.

FARMING in Hertfordshire, which was largely an arable county, has been eulogized by Ernle,^{1*} but the heavy two-wheel plough used, meets with no commendation from contemporary writers, although a similar implement was used all through the Chilterns and west through Berkshire, Wiltshire, etc.² It was not considered satisfactory by Mortimer, who had known it to fly out of the land and make poor work, involving the re-ploughing of the land a number of times.³ Much of the arable was worked on the three-field system,⁴ but quite a large proportion of the county was enclosed, and it is, therefore, esteemed as one of the counties, with Essex, Kent, Berkshire, Surrey, Wiltshire, Somerset, Hampshire and others, where people lived happily and were able to supply corn to open-field counties.⁵ Certainly, in the early years of the century, people were fined for unhusband-like practices, such as not scouring watercourses, or for stopping up ditches and encroaching on the commons.⁶

A great deal of field drainage, by means of the so-called hollow drains, i.e., a narrow trench half filled with stones or brush wood and filled up with soil, was done during the first forty years of the eighteenth century, and this was the more necessary in some districts because the arable is complained of as being either too much gravel or too much clay.⁷ Arrangements had been made by the farmers of the Chiltern common fields before the end of the seventeenth century, whereby turnips could be grown on them,⁸ a most unusual arrangement; in other counties at that date, it was only on enclosed land that rich landlords were able to introduce turnips and clover. The clover in this county was usually sown under oats, or with peas and beans, instead of barley as in East Anglia.⁹ Peas were grown every year on the Chilterns "for refreshing land and fodder of stalks in winter and spring."^{9a}

Manures such as rags, horn shavings, and soot were brought down from London, usually in the barges, carts and waggons that had taken up the corn, and buckwheat was

* For references, see pages 946, 947.

ploughed in for green manure: where sainfoin was grown on the chalk it was sometimes, like clover, used for this purpose as well as for fodder.¹⁰ Chalk was used on the clay, and clay on the gravel, and the practice of folding sheep on turnips on the enclosed lands excited Kalm's admiration in 1748.¹¹ In spite of all this, the farmers of Berkhamsted were condemned by Ellis for looking to their wheat crop to pay their rent, and having little straw for fodder because they did not chalk their lands, so being obliged to buy horse fodder from better farmers,¹² but this was perhaps a little unjust. He declares that the best farmers were about Ivinghoe, where the land, double-dressed by the fold and carted dung, frequently returned as much as forty bushels an acre,¹³ but, if we may believe Kalm, they were no better off for straw fodder, because in that woodless district they were forced to use the straw as fuel.¹⁴ Moreover, the sheep were turned on to the young wheat in the spring,¹⁵ and the practice of growing tares for horse fodder supplied that need.¹⁶

There was some excuse for the wheat farmers in this county. The variety cultivated was known as Red Lammas or Kentish, and the flour, known as Hertfordshire White, was said to be in many respects superior to all other kinds.¹⁷ Barley and oats were also extensively cultivated, and Ellis recommends the use of the spiky roller on the first. In his day, barley was specially prominent in the district round Baldock, Hitchin, Royston and Ware.¹⁸ He also mentions that peas were sown in drills and that beans were dibbled in the Vale, by means of a plough with a hopper fixed to it which dropped the seed at regular intervals.¹⁹

The majority of the farms in the county at the end of the century were of about 150 to 400 acres, while many were much smaller and few larger.²⁰ The implements used had not materially changed during the hundred years, although in his report²¹ Young mentions four threshing mills, and the earlier report does not describe the farming as being so very different from what it was in Ellis's time.²² Bradley's remarks about the prevalence of the three-course system must, I think, be taken with a grain of salt, because, in a county where turnips were sown in open fields, the three-course system had broken down before the end of the seventeenth century. Young, indeed, thinks the farming of the county had been at a standstill for a hundred years.²³ This is, of course, obviously not quite true, if only on account of the draining

done in the first half of the century, but what it amounts to is that the county was one of the first to adopt the improved agriculture of the late seventeenth century, particularly the new grasses and turnips, and that it did not progress much after it had adopted them.

Middlesex was in the main famous because it contained London and vast heaths, but its arable was subjected to constant cropping. The course seems to have been wheat, followed by peas at the end of October, gathered green for market in May or June or fed off in the beginning of July, then plough for turnips, which were off by the following January. Kidney beans were then sown in April and gathered in September, after which beans were set in October to stand the winter, and a further succession of market-garden crops followed;²⁴ but whether we can accept this or not is undetermined, because Bradley gives a long succession of crops which would have occupied many years after the book was written. There is no doubt that a great many market-garden crops were grown, because the whole requirements of London in vegetables, etc., were supplied from within a twelve-mile radius of the City.²⁵ The Middlesex fields were like gardens and the farmers were half gardeners. It was only nine years since onions had become a field crop and twelve since kidney beans had been raised in the fields about Battersea and Wandsworth²⁶ in Surrey: cabbages were likewise field crops.²⁷ At the end of the century there was not much change. The first report tells us that the land was mostly meadow for hay for the London market, and that manures were obtained from London,²⁸ but the second states that the arable was not confined to the open fields, that the east of the county was in the old three-field course of wheat, barley, fallow, but that fallowing was given up in the main, and the west went in for wheat, peas and beans, the last two being hoed. Green and root crops were cultivated in great abundance, and still the manures were obtained, as they obviously should have been, from London,²⁹ so that no great change had taken place here.

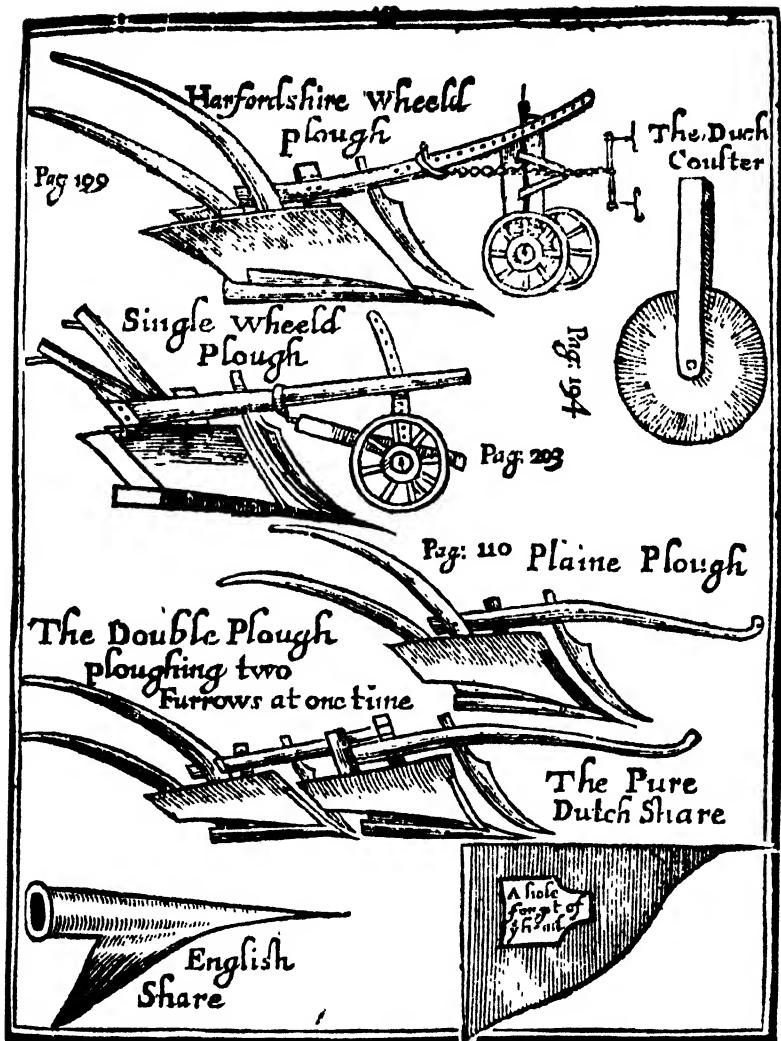
¹ *English Farming, Past and Present*, pp. 190-191.

² John Mordant: *The Complete Steward*, 1761, p. 273.

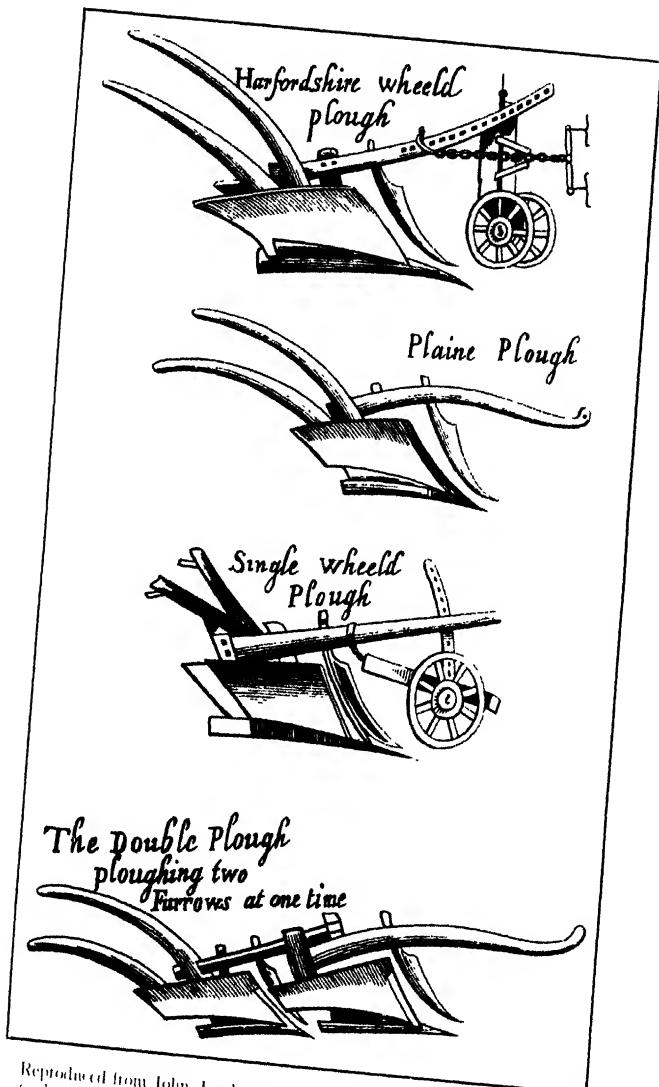
³ *The Whole Art of Husbandry*, 1707, p. 43 ff.

⁴ R. Bradley: *Complete Body of Husbandry*, 1727, pp. 247, 284. Matthew Peters: *Rational Farmer*, 1771, p. 95 ff.

⁵ Leonard Meager: *Mystery of Husbandry*, 1697, p. 132. T. Hale *Compleat Body of Husbandry*, p. 289 ff.



Reproduced from Walter Blith - *The English Interpreter Improved* 1653



Reproduced from John, Lord Somerville's *Fact and observations relating to sheep ploughs*, 1803. Lord Somerville expressed the opinion that no marked change had taken place in the Hertfordshire type of plough in the 150 years between Blith's book and his own.

18TH-CENTURY CROP HUSBANDRY: HERTFORD & MIDDLESEX

- ⁶ W. J. Hardy : *Hertfordshire County Records*, II, pp. 27, 28, 34, 36, 40, 42.
- ⁷ N. Salmon : *History of Hertfordshire*, 1728, p. i. S. Simpson : *Agreeable Historian*, 1746, II, p. 252. W. Ellis : *New Experiments in Husbandry for the Month of April*, 1736, p. 14.
- ⁸ W. Ellis : *ibid.*, p. 12; *Modern Husbandry*, IV, June, p. 30-31. See also C. Varlo : *A New System of Husbandry*, p. 287.
- ⁹ W. Ellis : *ibid.*, p. 62; see also *Modern Husbandry*, Feb., p. 89 ff.
- ¹⁰ *Modern Husbandry*, *ibid.*, p. 39.
- ¹¹ R. B. : *Treatise Concerning the Manner of Fallowing of Ground*, 1724, p. 31. Robert Brown : *The Compleat Farmer*, 1759, p. 111. T. Hale : *op. cit.*, p. 18.
- ¹² Kalm's *Account of his Visit to England*, 1748, translated by Joseph Lucas, 1892, p. 281.
- ¹³ *Chiltern and Vale Farming Explained*, 1733, p. 24.
- ¹⁴ *Ibid.*, p. 9 ff.
- ¹⁵ *Op. cit.*, p. 276.
- ¹⁶ *Ibid.*, p. 282.
- ¹⁷ Ernle : *op. cit.*, p. 191, citing Ellis and Young.
- ¹⁸ John Laurence : *New System of Agriculture*, 1726, p. 92; *The Farmer's Compleat Guide*, 1780, pp. 21-24.
- ¹⁹ *New Experiments*, 1736, p. 6 ff; *Practical Farmer*, 1732, p. 27.
- ²⁰ *Practical Farmer*, p. 17; *Chiltern and Vale Farming*, p. 230.
- ²¹ Young : *County Report*, 1804, p. 23. See also *Northern Tour*, 2nd ed., 1770, pp. 13-19.
- ²² pp. 36, 40 ff.
- ²³ D. Walker : *Hertford*, 1795, pp. 24, 25.
- ²⁴ *County Report*, 1804, p. 55. See also pp. 56-157.
- ²⁵ Richard Bradley : *Complete Body of Husbandry*, 1727, p. 247.
- ²⁶ William Guthrie : *A New Geographical, Historical and Commercial Grammar*, 1771, I, p. 229.
- ²⁷ An 18th Century spelling of Wandsworth.
- ²⁸ Bradley, *op. cit.*, p. 253.
- ²⁹ Peter Foot : *Middlesex*, 1794, p. 20 ff.
- ³⁰ John Middleton : *Report*, 1798. Also ed. of 1807, p. 138, 149, 151, 164, 186, 188, 301, 303.

MARKETING NOTES

Milk Marketing Scheme. Pool prices and rates of producer-retailers' contributions for November, 1936, are given below, with comparative figures for October, 1936, and November, 1935. The wholesale liquid milk price was 1s. 5d. per gal. in each month.

Region	Pool Prices			Producer-Retailers' Contributions		
	Nov. 1936	Oct. 1936	Nov. 1935	Nov. 1936	Oct. 1936	Nov. 1935
	d.	d.	d.	d.	d.	d.
Northern ..	13½	13	13½	3 1/8	3 1/8	3 1/8
North-Western ..	13½	13	13½	3 1/8	3 1/8	3 1/8
Eastern ..	13½	13½	13½	2 7/8	3 1/8	2 1/8
East Midland ..	13½	13	13½	3 1/8	3 1/8	3 1/8
West Midland ..	13½	12½	13	3 1/8	3 1/8	3 1/8
North Wales ..	13½	12½	13	3 1/8	3 1/8	3 1/8
South Wales ..	13½	12½	13½	3 1/8	3 1/8	3 1/8
Southern ..	14	13½	13½	2 11/16	3 1/8	2 1/8
Mid-Western ..	13½	12½	13	3 1/8	3 1/8	3 1/8
Far-Western ..	13½	12½	13	3 1/8	3 1/8	3 1/8
South-Eastern ..	14½	13½	14	2 1/2	3 1/8	2 1/2
Unweighted Average ..	13·55	12·91	13·36	3·03	3·63	3·23

These prices are exclusive of any premiums for special services and level deliveries, and also of the accredited producers' premium of 1d. per gal.

The number of producers who qualified for the accredited premium was 19,625 and the sum required for the payment of the premium was equivalent to a levy of 349d. per gal. on pool sales.

The inter-regional compensation levy was fixed at 1½d. per gal. on liquid milk sales, compared with 2d. per gal. in November, 1935. A levy of ¼d. per gal. was made for general expenses.

Sales on wholesale contracts were as follows:—

	Nov. 1936			Nov. 1935	
	(estimated)				
				Gal.	Gal.
Liquid	46,508,102			45,594,413	
Manufacturing	18,132,585			19,259,058	
				64,640,687	64,853,471
Percentage liquid sales	71·95			70·30	
Percentage manufacturing sales	28·05			29·70	

The average realization price of manufacturing milk during November was 5·78d. per gal., compared with 5·79d. per gal. for November, 1935. The quantity of milk manufactured into cheese on farms was 702,329 gal., compared with

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1,836,381 gal. in October, 1936, and 516,502 gal. in November, 1935.

Inquiry into Objections to Amendments. The public inquiry into objections to the amendments to the Milk Marketing Scheme was adjourned on November 26, and the hearing of the special case of producers of Tuberculin Tested milk opened on December 10.

Milk Products Marketing Scheme. The public inquiry into objections to this Scheme opened in London on November 30, and was adjourned to Edinburgh on December 10. The proceedings were resumed in London on December 17.

Potato Marketing Scheme. Riddle Regulations. On November 20, the Potato Marketing Board announced that the minimum riddle of $1\frac{5}{8}$ in. for white varieties which had been in operation since October 1, 1936, was reduced to $1\frac{1}{2}$ in. in conformity with the riddle in operation for all other varieties.

Area under Potatoes in Great Britain. The Board have recently published an interesting booklet showing the acreage, by counties, of each variety of early and maincrop potatoes grown in the years 1934, 1935 and 1936 by registered producers under the Scheme. The booklet also contains a number of sectional maps showing the predominating varieties of potatoes grown in the main producing areas.

The proportion of the total area under second early varieties has fallen from 9·9 per cent. to 6·7 per cent. between 1934 and 1936, while the proportion under maincrop varieties has risen from 75·6 per cent. to 79·1 per cent.; the proportion under first earlies has remained practically unchanged. The most popular maincrop varieties in each year have been Majestic and King Edward VII, which together accounted for 72 per cent. of the maincrop acreage in 1936. The area planted with Majestics has increased from 130,000 acres in 1934 to 149,000 acres in 1936.

The booklet, which is entitled "The Area under Potatoes in Great Britain, Potato Marketing Board, Miscellaneous Publications No. 4," is obtainable from the Board, price 6d. post free.

Pigs and Bacon Marketing Schemes: Bacon Pig Prices for December, 1936. The contract price of the basic pig (Class I, Grade C) for December, 1936, was 12s. 1d. per score,

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compared with 12s. 2d. for November. The cost of the feeding stuffs ration was 9s. 1d. per cwt. as compared with 8s. 9d. for the previous month, while the ascertained price of bacon fell from 93s. 5d. to 90s. 2d. The realization value of offals rose from 8s. 8d. to 9s. 6d. per pig.

Cancellation of 1937 Contracts. The number of pigs contracted to be supplied by pig producers to curers in 1937 was 1,886,000. This number being less than the number (2,200,000) upon which the agreed guaranteed minimum prices were conditional, the Bacon Marketing Board, in the exercise of their right under the contract, have cancelled all contracts entered into for the supply of bacon pigs to bacon curers in 1937.

Foreign bacon allocations have already been fixed for the first six weeks of 1937, and it is not proposed to make any alteration in these arrangements. Thereafter, imports will continue to be regulated provisionally, with due regard to the supply situation, while the position of the Pigs and Bacon Marketing Schemes is under examination. The object of this examination is to devise machinery with a view to avoiding the difficulties which have been experienced in the past and have led to the action taken by the Bacon Marketing Board on the present occasion.

Bacon Import Regulation. The quota, referred to above, for imports from foreign sources has been determined only for the first six weeks of the year, i.e., January 1 to February 11, 1937. The quota is at a rate about 10 per cent. higher than that for the last four months of 1936, or about 3 per cent. lower than the rate that operated with slight variations for the period May, 1936, to August, 1936.

The allocations to individual foreign countries are as follows:—

Country	Allocations January 1 to February 11, 1937		Allocations January 1 to February 11, 1937	
	cwts. (a)	Country	cwts. (a)	Country
Denmark ..	391,511	U.S.S.R. ..	.. .. 5,241	
Netherlands ..	58,573	Argentina ..	.. .. 4,316	
Poland ..	49,016	U.S.A. ..	.. .. 49,324	
Sweden ..	28,978	Allowance for imports from foreign countries		
Lithuania ..	18,188	not scheduled to		
Estonia ..	4,624	the Bacon (Import		
Finland ..	2,466	Regulation) Order ..		
Latvia	4,316	14,917		

(a) Subject to amendment, in the case of certain individual countries, in respect of overshipments or undershipments in previous periods.

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Consumers' Committees for England and Great Britain :
Appointment of Assistant Secretary. Mr. R. A. Hill, of the Ministry of Agriculture and Fisheries, has been appointed Assistant Secretary of the Consumers' Committees for England and for Great Britain. Communications for the Committees should be addressed to the Assistant Secretary at 10, Whitehall Place, S.W.1.

Consumers' Committee for Great Britain : Pigs and Bacon Marketing Schemes. The Food Council have submitted a report on Bacon to the President of the Board of Trade. Copies of this report have also been sent to the Minister of Agriculture and Fisheries and the Secretary of State for Scotland, as it expresses the views of the Consumers' Committee for Great Britain on the operation of the Pigs and Bacon Marketing Schemes. The report may be obtained, free of charge, on application to the Secretary, Board of Trade, Great George Street, S.W.1.

The Council find that since the initiation of the Schemes and the regulation of imports, the home production of bacon and hams has substantially increased, and that prices have been steadier. Prices received by pig producers do not appear to have been excessive, and retail prices, while substantially higher than in the slump period, 1931-32, do not seem unreasonable when compared with the average of the five years preceding the Schemes and with other food prices. It is true that bacon is not so plentiful and cheap as in 1931-32, but consumers still have a wide range of prices from which to select, having regard to the various cuts available and to supplies of the cheaper grades of British and Empire bacon. The Council think that demand may perhaps be too much concentrated on one or two favoured cuts and kinds of bacon.

The Council consider that judged by the criterion of steadiness of prices, the control of bacon imports, although made difficult by the uncertainty of home and Empire supplies, has had very satisfactory results on the whole. They consider that greater flexibility should be permitted in the total supply figure, as the rigid observance of a static limit for total consumption allows no room for expansion of demand and involves the risk that a section of the bacon market may be lost and not easily recovered. The Council hope that when it becomes possible to give effect to the policy of a levy-subsidy the import regulation arrangements can be made more elastic. There would then be greater scope for the

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services of the Market Supply Committee in watching and advising on the operation of these arrangements, and the Committee might be assisted by a Consultative Committee representative of the bacon industry and of all sections of the distribution trade.

The Council consider that the whole price structure of British bacon should be more closely examined. The cost of pig production must be continuously kept under review, and the difference between a fair price to producers and the price paid by consumers analysed. Steps must also be taken to see that consumers derive full benefit from any reduction in the cost of curing which may result from measures of rationalization undertaken by the Bacon Development Board after the end of 1937. For this reason the Council consider it essential that the Development Board should be given powers to investigate the cost of curing in factories.

The Council state that there has been some criticism of the quality of British bacon, but it appears to be agreed that a definite improvement has taken place since the early days of the Schemes. They would like to see the grading of pigs placed in strong and impartial hands and consider it important that the difference in prices between grades should afford a sufficient incentive to the improvement of quality.

While some progress has been made in regard to the adequacy and regularity of the supply of pigs to factories and the closer adherence to contracts, the Council suggest that there is still room for considerable improvement in these respects.

Live Stock Industry Bill. The Bill to give effect to the Government's proposals for the assistance and development of the live-stock industry, was introduced into the House of Commons on December 4. It provides for the establishment of a non-representative Live Stock Commission, which will not only take over the duties of the present Cattle Committee in regard to the administration of subsidy payments to producers of fat cattle, but will have a wide range of functions in relation to the live stock industry as a whole. The Commission will be charged with the duty of keeping generally under review matters relating to the live-stock industry and of advising and assisting Ministers in such matters, and they will have an important part to play in the development of measures designed to bring about increased efficiency in marketing and

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slaughtering. The Bill also provides for the constitution of an Advisory Committee, representative of all interests immediately connected with the industry, for the purpose of advising and assisting the Commission in the discharge of their functions.

It is proposed, in substitution for the existing emergency provisions, that, as a permanent arrangement, sums up to £5 million per annum should be made available for the payment of a subsidy to producers of fat cattle in the United Kingdom of such amounts or at such rates as the situation may from time to time require. The detailed arrangements for the payment of subsidy are not included in the Bill, but it will be possible to adjust subsidy payments so as to give further encouragement to the production of good quality cattle.

It is proposed, as a precautionary measure, to seek general powers to regulate imports of live stock and meat if it appears desirable in the general interest to do so in order to secure the stability of the market for meat in the United Kingdom.

Provisions designed to improve the system of live stock markets in Great Britain are contained in the Bill. It is proposed that, subject to certain exceptions, on and after August 1, 1937, no premises in Great Britain other than premises on which a live-stock market was formerly held at some time during the year ended on November 30, 1936, shall be used for holding a live-stock market unless the premises are approved for the purpose by the Live Stock Commission. The Bill enables the Live Stock Commission to submit to the appropriate Minister the draft of an order for controlling the holding of live-stock markets in any area in Great Britain where the Commission are satisfied that it is expedient that the holding of such markets should be controlled with a view to the promotion of efficiency or economy in the marketing of live stock. Provision is made for consultation with local authorities and other local interests concerned, for the holding of public inquiries, and for the order, if opposed when made by the appropriate Minister, to be provisional only and not to have effect until confirmed by Parliament. Provision may be made in the order for the payment of compensation by the Commission to persons who suffer any loss or damage in respect of their interest in any land used or appropriated for the holding of markets or in respect of their business as auctioneers, and for the assessment

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and recovery of contributions from other market owners and from auctioneers. Provision is also made for the making of by-laws by the Commission regulating such matters as market charges and the holding of live stock auctions.

The Bill makes provision for the initiation of three experiments in central slaughtering and for Exchequer assistance by grant or by loan, up to £250,000 in all, of which not more than £150,000 may be by way of grant, towards the cost of carrying out such experiments. Provision is also made for the payment of compensation by the Commission to interests affected by a slaughterhouse scheme, and for the collection of contributions from the person carrying on the central slaughterhouse and from other interests concerned.

It is proposed that the Live Stock Commission shall be enabled to make and submit schemes, at the request of any substantially representative body in the industry, for the performance and financing of such services as the encouragement of research and education and of co-operation in matters affecting the live stock industry, and the insurance of live stock and the advertising of meat.

The efficiency proposals in the Bill will be financially self-supporting and will, therefore, make no appreciable call upon money which might otherwise be available for the payment of the cattle subsidy.

Scope has been left for producers to organize themselves by a marketing scheme under the Agricultural Marketing Acts, if they so desire.

The Debate on the Second Reading of the Bill will take place after the Christmas recess.

Marking of Imported Cattle. An Order amending the Cattle Industry (Marking of Imported Cattle) Orders came into force on December 21. Whereas the original Orders provided, with certain exceptions, for the marking of imported cattle over six months old, the Amending Order requires the marking at ports or points of entry in Great Britain or Northern Ireland of all imported bovine animals unless they are:—

- (a) Bulls which have grown a fifth permanent molar tooth, or
- (b) Cows which have grown more than six permanent incisor teeth, or
- (c) Registered pedigree cattle.

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Cattle Fund. The following table gives particulars of payments made under the Cattle Industry (Emergency Provisions) Acts, 1934 to 1936, and shows the numbers of animals marked on importation into Great Britain:—

	1936 April 1 to Nov. 30	1935 April 1 to Nov. 30	Sept. 1, 1934,* to Nov. 28, 1936
Payments	£2,600,930	£2,517,813	£8,483,517
Animals in respect of which payments were made	1,117,405	1,067,318	3,588,016
Average payment per animal	£2 6s. 6d.	£2 7s. 2d.	£2 7s. 3d.
Imported animals marked at ports (Great Britain only)	371,256	294,174	1,151,933†

* Commencement of subsidy payments.

† As from August 6, 1934.

Milk Acts, 1934 and 1936 : Manufacturing Milk. Advances made by the Ministry up to December 15, 1936, in respect of manufacturing milk were as follows:—

Section of Act	Period of Manufacture	Gallons	Advances.
<i>(a) Milk Marketing Board for England and Wales.</i>			
1	In respect of Milk : Manufactured at factories other than the Board's	April, 1934, to July, 1936	£
2	Manufactured by the Board ..	April, 1934, to Sept., 1935	462,609,723 2,139,236
3	Made into cheese on farms ..	April, 1934, to June, 1936	2,573,662 12,850
	* Total for England and Wales ..	36,055,516	187,463
<i>(b) Government of Northern Ireland.</i>			
6	In respect of milk : Manufactured into cream and butter at registered creameries ..	April, 1934, to Sept., 1936	£
		60,168,430	359,021
	TOTAL ..	561,497,331	2,698,570

* Owing to the Cheese-Milk Prices for August and September, 1936, being in excess of the Standard Price, no subsidy is payable in respect of milk produced and manufactured in these months.

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Milk in Schools Scheme. Exchequer contributions up to December 15, 1936, towards the expenses of the Milk Marketing Board for England and Wales in respect of the supply of 44,484,572 gal. of milk to school children at reduced rates during the years October, 1934, to September 1936, amounted to £796,620. 21,632,336 gal. of milk were consumed in the second year of the scheme as compared with 22,852,236 gal. in the first year. Further returns will slightly increase the figures for the second year.

Cheese-Milk Price. For the purpose of payments under the Milk Acts, 1934 and 1936 (whether by the Exchequer to Milk Marketing Boards or by Boards to the Exchequer), in respect of milk used for manufacture, the cheese-milk price has been certified by the Minister and the Secretary of State for Scotland to be 5·98 pence per lb. for the month of December, 1936.

Wheat Act, 1932 : Sales of Home-grown Wheat, Cereal Year, 1936-37. Certificates lodged with the Wheat Commission by registered growers during the period August 1, to December 4, 1936, cover sales of 9,142,966 cwt. of millable wheat as compared with 15,237,600 cwt. in the corresponding period (to December 6) in the last cereal year.

Sugar-Beet : Determination of Acreage for 1937 Crop. The Sugar Commission is required by Section 5 (1) of the Sugar Industry (Reorganization) Act, 1936, to determine for each year a maximum acreage in respect of which contracts may be entered into by the Corporation with a view to securing that the quantity of sugar produced by the Corporation in each year from home-grown beet is as nearly as may be equal to 560,000 tons of white sugar. The Commission has accordingly fixed a maximum of 405,000 acres for contracts in respect of the 1937 beet crop. This figure has been provisionally subdivided as follows: English factories 390,000 acres, Cupar factory 15,000 acres.

Production of Home-grown Beet-Sugar during 1936-37 Campaign. According to information furnished to the Ministry by the British Sugar Corporation, Ltd., the total quantities of beet-sugar manufactured in Great Britain during November, 1936, and during the corresponding month in 1935, were:—

			<i>White cwt.</i>	<i>Raw cwt.</i>	<i>Total cwt.</i>
1936	1,712,794	1,698,168	3,410,962
1935	1,470,236	1,665,380	3,135,616

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The total quantities of sugar produced to the end of November in each of the two manufacturing campaigns were:—

	<i>White cwt.</i>	<i>Raw cwt.</i>	<i>Total cwt.</i>
Campaign 1936-37	3,135,017	2,857,866	5,992,883
Campaign 1935-36	2,785,948	3,332,151	6,118,099

The Sugar (Rate of Assistance) Order, 1936. In accordance with the provisions of section 14 of the Sugar Industry (Reorganization) Act, 1936, the Minister of Agriculture and Fisheries, with the consent of the Treasury, has made the above-mentioned Order (S.R. & O. 1936 No. 1,307) prescribing a rate of 5s. 3d. in respect of the year starting on April 1, 1936, for the purpose of enabling the effective rates of assistance in respect of sugar manufactured by the British Sugar Corporation, Ltd., from home-grown beet to be calculated. The Order also fixes £240,000 as the minimum sum to be placed by the Corporation to a depreciation reserve during the year and specifies an estimate of 4s. 6d. per cwt. for the average raw-sugar price and an estimate of maximum quota income of £631,728 18s.

National Mark Eggs. Notice has been given in the *London Gazette* of the Minister's intention to make the following amendments to the Agricultural Produce (Grading and Marking) (Eggs) Regulations, 1936, in regard to hen eggs produced in England and Wales. The amendments will take effect on or about January 13.

" Article 1 and the First Schedule to the Agricultural Produce (Grading and Marking) (Eggs) Regulations, 1936, (hereinafter called the Principal Regulations) shall be read as if there were included therein the grade designations

SPECIAL weight and SPECIAL as alternatives to the grade designations New Laid SPECIAL weight or New Laid SPECIAL

STANDARD weight and STANDARD as alternatives to the grade designations New Laid STANDARD weight or New Laid STANDARD

MEDIUM weight and MEDIUM as alternatives to the grade designations New Laid MEDIUM weight or New Laid MEDIUM

PULLET weight and PULLET as alternatives to the grade designations New Laid PULLET weight or New Laid PULLET and the Principal Regulations shall have effect accordingly."

National Mark Publicity. During the March quarter of 1937, National Mark Exhibitions and "Weeks" will be held in Norwich (February 10-20) and Ipswich (March 10-20).

At the British Industries Fair, to be held at Olympia from February 15-26, the Ministry will stage a comprehensive display of National Mark products. Sample products and a full range of the Ministry's publications will be on sale.

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THE Forty-Seventh Meeting of the Council of Agriculture for England was held at the Middlesex Guildhall, Westminster, on Thursday, December 10, 1936, *Alderman G. E. Hewitt* in the Chair. *The Minister, the Rt. Hon. W. S. Morrison, M.C., K.C., M.P.; the Parliamentary Secretary, the Earl of Feversham; and the Permanent Secretary, Mr. Donald Fergusson, C.B.*, attended on behalf of the Ministry.

McCreagh Estate. *Mr. H. W. Thomas* (Hants) asked whether the Ministry had been able to do anything with regard to the derelict estate in Hampshire. *Mr. George Dallas*, in reply, said that the matter was still before the Standing Committee and that the Committee would take an early opportunity of raising the question with the Ministry on behalf of the Council.

Agricultural Education and Farm Institutes. *Mr. W. R. Smith* moved the adoption of the Report by the Standing Committee on Agricultural Education and Farm Institutes (see Appendix I, page 969). The Report was adopted.

Rural Housing. *Lord Cranworth* (East Suffolk) moved the adoption of the Standing Committee's Report on Rural Housing (see Appendix II, page 971).

Lt.-Col. G. H. Long, O.B.E., said that in West Suffolk the Council had been overwhelmed with applications in respect of housing in rural districts. In one district, with 20 small parishes, a survey had been made, with the result that 153 cottages were condemned as unfit for human habitation. One of these cottages was on land which he was farming and was rather typical. It had three rooms, two of which were bedrooms, one just big enough to get a double bed in, and the other was only 6 ft. by 4 ft. The District Council were proposing to build new houses for the men turned out. He thought that bad housing in rural districts was a more serious deterrent to a sufficient supply of labour for the land than were low wages. *Mr. G. Craven* (Holland) was in favour of the Report because the reconditioning and re-building which was going on under Demolition Orders were not providing the additional houses required. In his own parish, there were over 100 applicants for houses, many being young people intending to marry.

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Mr. T. Lovell, *Mr. W. Holmes* and *Mr. A. Pearce* also spoke in favour of the Report. *Mr. C. H. Roberts* (Cumberland) said that the Council should be clear on what was really wanted. Under existing powers, houses were being condemned, or reconditioned, or built anew, given an energetic County Council and a District Council that knew its job. But when all was done, there was still a shortage of rural houses, and what was wanted was a subsidy for new houses so that agricultural workers could be properly housed. *Alderman W. H. Turner* (West Riding) said he thought the figure of £800-£1,000 a pair for new cottages rather high. *Mr. George Dallas* said good housing was essential if agriculture was to be helped by keeping on the land men and women of the right type, and all authorities, national and local, should do everything possible to amend the situation. *Mr. Cecil Robinson* (Holland) said that if he had his way he would do without subsidies, trusting to tariffs and quotas. Agriculture should be placed on a sound footing so that millions more pounds worth of agricultural produce might be grown. This would allow the farmer to pay labour a better wage and so enable the labourer to pay an economic rent. *Major R. G. Proby* (Hunts) said that if subsidies were granted he hoped that they would be available to private landowners as well as public authorities. Landowners would see to it that the tenant got the benefit. *Mr. W. R. Smith* referred to a newspaper report of a Rural District Council Meeting at which the Chairman had said that so many houses were dilapidated that people living in them had to sleep downstairs, and that the buildings were in danger of collapsing at any moment. It was important to keep on the land those men and women who by instinct and tradition, and by daily contact, were highly-skilled agricultural workers. It could not be done without a strong national policy towards proper housing. *Mr. Donald Fergusson*, on behalf of the Ministry, said that the Ministry would have pleasure in forwarding the Report of the Standing Committee, if passed by the Council, to the Sub-Committee of the Ministry of Health which was considering the whole matter of rural housing. In winding up the debate, *Lord Cranworth* said that the tied cottage was not referred to in the Report because it was a controversial question. He did not, however, think it controversial to say that the landlord who does not keep his tied cottage in a good state of repair is not only wrong but very foolish. As regards the suggestion that had been made

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that the figure of £800-£1,000 for a pair of cottages was rather high, he called attention to the sentence in the Report which made it clear that an essential need was to ensure that cottages shall be more commodious and comfortable than had been considered as suitable in the past. The Report was put to the Meeting and adopted.

The Minister's Address. *The Chairman* welcomed the Minister to the first Meeting of the Council held since the Minister came into office. In the course of his address, which dealt mainly with the broad outlines of the Government's agricultural policy, *the Minister* said that he would do his very best to see that agriculture was maintained in its proper position amongst the activities and industries of the country. Farming was an industry in which long-range views were essential not only on the part of Ministers, but on the part of those who work on the land. Consequently, what is required above all things is that the policy should have permanence and continuity so that people shall know where they are and what they can expect in the years lying ahead. The Minister then referred to the great services that his predecessor in office had rendered to British agriculture, and said that his own appointment did not mean any breach in continuity of policy. In the course of his duties as Financial Secretary to the Treasury, he had had to express the views of H.M. Government at Geneva on the subject of world trade, and had then to deal with other countries' restrictions on trade made with the object of keeping up an unsatisfactory currency position. This country had no such currency difficulties. Our quotas and tariffs, insofar as they affected agriculture, were imposed for the assistance of the industry and to maintain our vital needs. He wanted to make that point clear because it had been wrongly said that he was a "Free Trader." He believed that agriculture to-day must continue to receive protection and assistance in order to secure to our own people a sufficient supply of food at reasonable prices with a prospect of reasonable remuneration not only to home farmers, but to farm labourers. The Minister then briefly sketched the position in regard to the chief agricultural commodities—meat, wheat, sugar, milk, pigs, bacon, hops and potatoes. Prices of agricultural commodities, taken as a whole, in October and November of this year, and taking the subsidies into account, were back to the 1930 level and were 23 per cent. above the

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low level of 1932. Protection had raised agricultural production in 1934-35, when it was 19.7 per cent. higher than in 1930-31.

As regards the Live-Stock Industry Bill, he had read the Report of the Standing Committee, which showed what in his view was so valuable, namely, really constructive thought on the subject. It was very usual for a Minister to receive much negative criticism, but it was a great help when constructive proposals were made. The Report called for a general grading up of live stock, for improved marketing intelligence, and the need for a regulated market for live stock and meat. These points were being met in the Bill now before Parliament. The proposals in the Bill were to set up a Permanent Commission for live stock, which would be a body able to negotiate in the producers' interests with Local Authorities on the various matters which would arise under the Bill. Thus the reorganization of the industry, and the administration of the £5 million subsidy proposed under the Bill, would be entrusted to this Permanent Commission, which he hoped would have the confidence of the agricultural industry. The Minister then gave an outline of the Bill, remarking upon the purpose of each Part in turn. In passing, he reminded the Council that permanence in policy could only be achieved by the goodwill of the whole people, and that it was one of the most hopeful signs of recent years that there had been a change of public opinion in the direction of sympathy with agriculture. We had, he said, to convince the public that we were dealing with our trust—the land—in a way which was for the benefit of the whole country. Given that and genuineness of support, and he was sure that the prospects of the industry were good.

Lord Eltisley, K.B.E. (Cambs), moved a hearty vote of thanks to the Minister for his address. The Council was at one with the Minister in its anxiety to see the greatest possible production of good foodstuffs secured from the land of the country. A strong and vigorous agricultural policy was vitally necessary, and the chief purpose of the Council was to further and assist any action in the direction of attaining it.

Mr. George Dallas seconded the vote of thanks, welcoming also the Earl of Feversham and Mr. Donald Fergusson. He added that the Council represented every interest in agriculture, and he thought that the Minister could always count

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on its loyal help and support. As to the Ministry, it should be put on as high a level as any other Department of State. The vote was carried with acclamation.

Rabbit Problem. *Lt.-Col. Sir Merrik Burrell, Bart., C.B.E.* (West Sussex), moved the adoption of the Standing Committee's Report on the Rabbit Problem (see Appendix III, page 973). He proposed certain small alterations which were adopted. One of these dealt with the use of steel traps, which Sir Merrik pointed out were used not only to catch rabbits, but other vermin, e.g., the grey tree rat. He suggested that the Report, if adopted, should be sent to the Clerk of the Select Committee of the House of Lords.

Mr. W. Hearle (Cornwall) thanked the Committee for the Report, though he said it did not carry the Council much further. In relation to grading the rabbits, he added that English rabbits were quite frequently graded. They were not graded when they were sent through the hands of the small dealer. He did not agree with the last clause, because, when land was once cleared, rabbits came in from outside, and it was soon as bad as it had been before. In some respects this country was still a dumping ground for surplus products, though he was encouraged by the frequent repetition of the promise to give English farmers the first place in the British market.

The Report, as amended by Sir Merrik Burrell, was adopted.

Liming of Land. *Mr. C. C. Smith* (East Suffolk) moved the adoption of the Standing Committee's Report on the Liming of Land (see Appendix IV, page 974), in which he said that the word "lime" was meant to refer to all approved sorts of lime. The Report was adopted without debate.

Tuberculin Test for Imported Cattle. *Professor A. W. Ashby, M.A.*, moved the adoption of the Standing Committee's Report on the Question of the Tuberculin Test for Imported Cattle (see Appendix V, page 975). *Mr. D. G. Watkins* (Hereford) said that he was disappointed that a way could not be found of putting Irish cattle under the same conditions as Canadian. He thought it a disgrace seeing old cows from Ireland being sold in our markets from 7s. 6d. up to £5. He asked whether we were doing our best to provide purity and quality by allowing these cattle to come in, knowing that a

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big percentage were tuberculous and not subject to a single test. He would not ask for the double test. *Lord Cranworth* said that as a member of the Standing Committee he disagreed with the Report, and he was sorry to be at variance with the majority of the Committee. He maintained that it was a reproach to British agriculture to have so large a percentage of tuberculous cattle, and to endeavour to remove that reproach the Government had used moral persuasion and local sanction, and were spending public money to induce people to clean up their herds, but they were making practically no advance except in a few limited territories, mostly in Scotland. It was inconsistent with this policy to admit every year 350,000 animals without test, and conditions in Ireland may be worse than they are in this country. He admitted that a false sense of immunity might follow if these animals were tested, because many of them would be reinfected again, but the making of the test would prevent, at least, numbers of animals coming to this country which were known to be infected, and would show the public that it was not only lip service being given to the doctrine of eradicating the disease. *Sir Merrik Burrell* said that no one was more anxious to see the eradication of tuberculosis from herds than he was. The incidence of the disease in our own cattle was something like 40 per cent., and the greater part of it amongst the older cows. The cattle coming from Ireland were not old cows, they were chiefly young bulls and heifers, and the incidence in the cows would, he thought, be much less than 40 per cent. If we were to insist that all animals had to be tested before they were sold on the market, he could not see how that could be supported in argument with the Irish Governments, especially when home-bred cattle were not to be likewise tested. Cattle tested once could not be given a certificate as safe cattle. They would, in fact, have a false certificate which would give people buying them a feeling of security they had no right to have. It was not difficult to enforce certification for the comparatively few cattle coming from Canada, but it would be impossible in the case of those coming from Ireland. They would have to be held some little time at the lairages, which might become infected and spread the disease. He therefore disagreed with the two previous speakers. *Mr. Watkins* then proposed that the Report be again referred back, and that pregnant cows and cows in milk should be subject to a test.

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Mr. A. Matthews (Hereford) seconded that proposition. *Professor Ashby* said that he thought Mr. Watkins was rather confusing two things. There was in his mind the question of a clinical examination of cows, especially old cows, which might disclose the existence of tuberculosis. On that point there could not possibly be any difference between him and any member of the Council or Standing Committee. The Committee would certainly agree that, in any case, where tubercular infection was discovered by clinical examination the animals ought to be excluded. There was, however, a different problem with the 300,000 or so maiden heifers coming from Ireland. A test would have to be made in Ireland, and who could rely upon decisions made on this vast number of cattle scattered up and down the farms of Ireland. There was another point, that, if such a test could be carried out and the heifers later imported on the certificate, there would be a premium placed on their value far in excess of any to which they had a right. When the country was ready for a general attack on the problem of bovine tuberculosis, then a test on all imported cattle could be required. The most practical work being done to-day in the direction of achieving freedom from the disease was in trying to discover areas which are relatively free, cleaning them up absolutely and keeping them free. There were two such districts in Wales, and in a year or two it would be possible to supply from them heifers guaranteed free from disease. When districts were cleaned, Irish or any other untested cattle would be excluded from them. He asked the Council to accept the Report with a rider to the Committee to pursue the consideration of the most practical methods of obtaining freedom of the herds of the country from tuberculosis. *Mr. Watkins* and his *seconder* agreed, and the Report was adopted.

Live-Stock Industry Bill. *Mr. George Dallas* proposed the adoption of the Standing Committee's Report on this Bill (see Appendix VI, page 977). *Mr. H. W. Thomas* asked whether the standard price referred to in the White Paper, 1934, could not be given.

Major R. G. Proby discussed the fundamental principles of cattle feeding in this country, and said that, if extensive cake-feeding could be supplanted by concentrated, home-grown food in a cheaper form, e.g., grass or root cake, the farmer would be better able to compete with the foreign producer.

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If a farmer could convert his cheaper products into cake, his industry would be more self-contained. Much experimental work had been done along that line, and he thought success might be achieved. He commended this line of inquiry to the Ministry of Agriculture. *Mr. J. O. Adams* (Northants) said that many more cattle should be reared in this country.

Sir Merrik Burrell, in reply, said that the subject of Major Proby's suggestion was under consideration by the Agricultural Research Council; one Report had been issued and another was coming forward. *Mr. George Dallas* gave Major Proby an undertaking that the Standing Committee would also look into the matter, as well as into the question of cattle rearing raised by Mr. Adams. *Lord Feversham* added that the question of importing feeding stuffs as an alternative to the importation of the actual product, beef, into the country, was a matter which was being very carefully considered both by the Committee of Imperial Defence and by the Food Defence Plans Department under Mr. French. The Report was then adopted.

Cottages at Aerodromes. *Sir Merrik Burrell*, on behalf of the Standing Committee, moved the following resolution :

"That the Council of Agriculture for England calls the attention of the Minister for Air to the fact that in the extension of old, and the establishment of new, aerodromes, the cottages which are being erected are frequently of a design and materials completely out of harmony with the architecture of the locality ; and that, in view of the efforts being made now by Local Authorities to preserve the natural beauties of the rural areas of the United Kingdom, the Minister for Air shall be urged to give instructions that, in future, County Councils shall be consulted as to the external design of such cottages and their acquiescence obtained before construction takes place."

It was seconded by *Brig.-Gen. H. Clifton Brown, M.P.* (West Sussex), and carried.

Travelling, Subsistence, etc. Expenses to County Agricultural Committee Members. *Mr. John Beard* moved the following resolution :—

"That this Council of Agriculture calls the attention of the Government to the difficulty of securing Labour representatives on many County Agricultural Committees owing to County Councils declining to make financial provision to meet the needs of the labourers for travelling, subsistence, and loss of pay ; and asks the Government to remedy this defect in the Act, either by itself or through instructions to County Councils to make such financial provision as will make it possible for labourers to give their quota of service."

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He said that, if the Government really wanted working labourers on the Committees, County Councils should see that the chosen men suffered no financial loss. Some County Councils already paid expenses; there should be a movement to bring the backward ones into line. *Professor Ashby* seconded the resolution. He added that it had been agreed in setting up County Agricultural Committees that every Committee should have the same kind of constitution as this Council, which had never been weakened in its Labour representation. The Ministry of Agriculture might consider how much it would cost them to contribute to the expenses of the Agricultural Committees in the ratio of 60 per cent. of its expenditure for this purpose. He thought that every County Council would come into line if an offer of this sort were made. The motion was put to the Council and carried.

Voting for Marketing Board Members. *Mr. F. Sole* (Isle of Ely) moved the following resolution :—

"That the Council of Agriculture for England considers that, in the interests of Registered Producers under the various Marketing Schemes, a simplified method of voting for the election of members of the Boards is highly desirable."

He sketched the practice to-day which resulted in forms being issued to people who did not know who were being put up for membership of Boards. Small-holders had no knowledge of proxies, and there were hundreds of thousands of producers who did not vote. The present method rather tended to overload the Board with nominations from the National Farmers' Union. Nominations should be made by registered producers in every case. *Alderman J. W. Payne* (Isle of Ely) seconded the resolution. *Mr. Fergusson*, on behalf of the Ministry, said that it was generally acknowledged that the arrangements made for voting were capable of improvement, and the matter was being considered by the Marketing Board Co-ordination Committee and a Sub-Committee of the National Farmers' Union. He thought it would be appropriate if a copy of this motion were sent to those bodies, as they were the proper authorities to make the changes. The motion was put to the Council and carried.

Balance of Agriculture. *Capt. W. G. Coates* (Leicester) moved the following resolution :—

"That the Council of Agriculture for England desires to draw the attention of H.M. Government to the fact that there is more apprehension amongst those engaged in Agriculture to-day concerning the Government's Agricultural Policy than at any time since they came

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into office. The Council therefore requests H.M. Government to take immediate steps to restore the balance of Agriculture, so as to enable it to produce at least 60 per cent. of those essential foodstuffs required in time of war."

He said that when the Government came into office the index figure for the price of fat cattle stood at 126 without any subsidy. Five years later it was 109, and with regard to store cattle, too, there had been a drop. Bacon figures had dropped from 121 to 114, whilst milk had finished at 171, though he gathered that this index figure was not that of the price which the producer got for milk on the farm. In earlier days, it was true to say that we literally commanded the seas; to-day, other countries had as strong navies as our own and the submarine position entirely altered the situation. As regards the balance of agriculture, the Government's economic policy had made the British farmer rely more and more on imported feeding stuffs. Twenty per cent. of the cost of milk was in feeding stuffs, and he suggested that, in view of the unstable conditions abroad, it would be wise to grow sufficient food for the people within the country; not sufficient for only three days a week, but for four at least. He did not necessarily fix it at 60 per cent. for each of the essential commodities, but he would like to see some such figure aimed at, so as to give a balanced ration for the people from our own soil.

Mr. A. L. Atkinson (Warwick) seconded. *Mr. A. E. Bryant* (Bucks) asked what the Committee on Food Supply in Time of War had done. There was plenty of land for growing increased food and there were men idle to-day. Why should they be paid the Dole in preference to setting them to work on the land—the foreigner worked full-time, producing food for us. Formerly, there were 40 labourers in his village helping to grow food for the people; to-day there were 5. *Mr. J. P. Terry* (Gloucester) asked for a quick remedy for the tremendous slump in certain prices, particularly those of beef.

The Minister of Agriculture said he was not going to enter at great length into the problems raised, and he was not going to hold Captain Coates to the 60 per cent. named, because he was sure that in Captain Coates' mind the figure was merely an indication of the increase which was desired. He would, however, give the Council a figure or two showing what it would mean to increase our output to 60 per cent. It would mean an increase of 157 per cent. in the wheat acreage;

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100 per cent. increase in the area under sugar; and 61 per cent. more milk. As to the balance of agriculture, he had heard the expression used with different meanings. To his mind there were two prominent factors in agriculture, namely, soil and climate. The balance of agriculture was the balance with relation to those two permanent factors; nobody could change them, except that you can add a little to the fertility of the soil. He, also, would like to see the greatest possible production of food in this Island, but he would like to see it done in conformity with the soil and climate, because, though it might be necessary to stimulate this or that particular branch of the industry for a particular purpose, the edifice had to be built upon a rock and that rock was the two factors named. What was in the Government's mind was to restore prosperity to all branches of agriculture so that the land might be developed along natural lines and produce the greatest amount of food that can be so produced. He was aware of the depression in the live-stock industry and of its bad repercussion on other branches. He had said what the policy was and expected it to be criticized because the £5 million would not be large enough. He would ask members not to criticize it with relation to prices as they were at the moment. This was the seasonal period for a flush of cattle in the markets, and the low prices would not be permanent. The tide was showing signs of turning, and in the subsidy a great number of producers would receive an extra reward for quality. He asked the Council to bear in mind the desirability of permanence of agricultural policy, the possibility of getting the most out of the land, and the fact that the Government were determined to develop agricultural policy on sound lines, so as to improve the return to agriculture of all those who were in it. *Captain Coates* asked permission of the Council to withdraw the figure of 60 per cent. The resolution was put to the Council and agreed, subject to the omission of the figure.

Diversion of Surplus Foods to Unemployed, etc. Major Nelson Rooke moved the following resolution:—

“That the Council of Agriculture for England is of the opinion that the Government should be asked to take immediate steps to ensure that any so-called ‘surpluses,’ i.e., amounts of agricultural produce grown in excess of ordinary requirements, shall be diverted, without loss to the producer, to any needy section of the population, such as those in receipt of National Health Insurance, Unemployment Relief, or other form of public assistance, as, in the interests of food production

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against an emergency, of proper nutrition for the under-fed, and of the agricultural industry itself, it is essential to stimulate production in this country."

He said that the Minister had shown how the land could be kept up and the fullest production obtained from it. From the point of view of the consumers' health, it was important for them to get as much fresh, home-grown food as possible. From the point of view of safety, which had been stressed not only by Captain Coates, but by Sir Merrik Burrell, it was likewise important. On the other hand, potato acreages were being restricted by the Potato Marketing Board. That seemed a pity when large sections of the population needed potatoes. He was aware of the experiment in providing surplus potatoes to a Distressed Area in 1935 and thought it worth repeating. Again as regards milk, too much milk went into manufacture, and better administration should give the producer a better price and the consumer more in quantity, so that no one would lose. In the Rhondda Valley, milk was sold at 1s. 4d. instead of 2s., and given to nursing mothers and young children. His proposal was that certain kinds of foods should be made available to certain classes of people on vouchers, the vouchers being based as to price upon the manufacturing or wholesale price. The recipients would have to come forward with their own jars and utensils when they used the vouchers. He thought there could be no better time than the present to stimulate a scheme of this kind. The resolution was duly seconded, and the suggestion made that it should be referred to the Standing Committee. *Major Rooke* agreed to that course, which was put to the Meeting and carried. The resolution accordingly stood referred to the Standing Committee for consideration and report.

APPENDIX I

Report from the Standing Committee: Agricultural Education and County Farm Institutes

1. The Standing Committee has from time to time given attention to the question of the provision of suitable education for young people who propose to take up farming as a career. The Committee has visualized such education as that which should be given from the time when rural children leave the country school to the time when they are old enough (i) to take on the management of a small farm holding, or (ii), in the case of those who propose to become agricultural workers, to perform satisfactorily the better-paid and more highly-skilled tasks on the farm. In exploring this ground, it has come to light that the facilities existing for this kind of education for such young people are comparatively few, and, what there are, are supplied as regards (i) by the teaching given at County

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Farm Institutes and similar institutions, nearly all of which are helped by substantial grants from public funds; and, as regards (ii), by organized classes held in the villages or country towns of certain of the more forward counties. This Report, however, is intended to deal in the main with (i) above and we may think it advisable to recur to (ii) in a later Report.

2. In the following statement are given a list of the existing Farm Institutes, etc., and, in brackets after the name, the approximate number of students each is capable of taking, or will be capable of taking, when certain proposed extensions are completed. The number of students actually receiving education at these institutes is in nearly all cases up to the limit of capacity, and, in some instances, even beyond it, some few students living outside the institutes.

<i>Counties</i>	<i>Farm Institutes, etc.</i>
Cheshire	Reaseheath .. (78)
Cumberland and Westmorland ..	Newton Rigg .. (18)
Durham (Northumberland) ..	Houghall* .. (60)
Essex	Chelmsford .. (60)
Hants (Isle of Wight) ..	Sparsholt .. (53)
Herts (Middlesex) ..	Oaklands .. (40)
Kent	Borden .. (40)
Lancs	Hutton .. (60)
Northants	Moulton .. (30)
Somerset	Cannington .. (50)
Staffs (Warwick and Salop) ..	Rodbaston .. (30)
Suffolk, West (Suffolk, East) ..	Chadacre .. (45) (Non-County)
Sussex, East	Plumpton .. (40)
Worcestershire	Avoncroft, ..
	Bromsgrove (30) (Non-County)
Yorks	Askham Bryan* (60)

* In course of erection.

3. In addition, arrangements have been made with three agricultural colleges to take students for shorter courses than are usual with them so that they may be able to give education of the same type as that given at farm institutes. The latest available figures of the numbers so accommodated are as follows:—

<i>Counties</i>	<i>Colleges</i>
Devon and Cornwall ..	Seale-Hayne (28)
Derby ; Notts ..	
Leicester ; Rutland ..	
Lincs (Lindsey) ..	
Lincs (Kesteven) ..	
Lincs (Holland) ..	
Gloucester ; Wilts ..	Midland Agricultural College .. (60)
	.. Royal Agricultural College, (20)
	Cirencester.

4. The counties without any farm institute facilities are Hereford, Norfolk, Isle of Ely, Cambridge, Hunts, Beds, Bucks, Oxford, Berks, Surrey, West Sussex and Dorset.

5. It appears to the Committee that, with the growing return of prosperity to the agricultural industry, the need for farm institute education is likely to increase far beyond the present supply. The smallness of the existing provision can best be realized by reference to the number of holdings of 150 acres or less in the district of any farm institute. The West Midland area (Staffs, Warwick, and Salop), for instance, considered as being served by the Rodbaston Institute with about 30 places, shows that there is one place for about every 770 holdings; and in Yorkshire when the Askham Bryan Farm Institute has been completed there will be one student place for every 550 holdings. The same figure obtains

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for Cumberland and Westmorland with the Newton Rigg Farm School. In some of the Southern districts the provision is rather greater, e.g., in Somerset, with Cannington Farm Institute, it is 1 for 225 holdings, and Essex 1 for 110. Again, according to the above data, the Royal Agricultural College, Cirencester, provides one short-course student place for 600 holdings in the district which it serves, whilst Seale-Hayne College has one for every 540. For the counties named in paragraph 4 there is no provision of the kind at all.

6. The Committee submits that this condition of affairs is unsatisfactory and should be remedied; and it suggests to the Council that Council members might very usefully give careful consideration to the position in their own counties, and, if they think it desirable on the facts as they find them, should propose to their County Committees and Councils that those bodies, too, should reconsider the matter with a view to securing an improvement in the position. If it is found in any county in which there are no existing facilities that it is impracticable to provide them on a county basis, then it is suggested that the possibility of combining with any adjoining counties similarly placed might be explored.

7. Furthermore, as this type of agricultural education is usually put under the management of the County Agricultural Organizer, we consider that the provision of farm institute facilities for the training of young farmers should not be allowed to diminish the very valuable aid given to farmers and the industry by the Agricultural Organizer and his staff through direct and indirect contact.

8. The Standing Committee is aware that much good foundation work for agricultural education is being done in many parts of the country through the medium of Young Farmers' Clubs. These clubs, considered as a means of practical training for young farmers and young agricultural workers, should be generally encouraged. In particular, with the latter class, do we think that there is scope for the club movement to give great help, both to the young workers themselves and to the agricultural industry, by encouraging them to study the simple scientific facts which underlie sound farming technique. There is also the Ministry of Agriculture's scheme of scholarships for the sons and daughters of agricultural labourers and others, which has helped to put many rural youths on the path which leads to efficiency in the industry. In the past ten years, about 900 scholarships have been given tenable at farm institutes by means of this scheme.

9. If any reinforcement of the plea for more farm institute facilities is needed, it can be found in a consideration of the position in Denmark. There, it is estimated that about one-third of the farmers on small and middle-sized holdings pass through the agricultural schools, which are somewhat of our farm institute type. The State contribution to the expenses and upkeep of the schools is not very heavy, and certainly not in anything like the proportion paid in this country (60 per cent.). Nevertheless, some 2,500 male students pass through these Danish schools annually, as against about 800 all told if all students stayed a year in the farm institutes, etc., in England.

APPENDIX II

Report from the Standing Committee : Rural Housing

1. At the last meeting of the Council, a Report was presented setting out the legislative position in regard to housing in rural districts. A resolution by Alderman E. G. Gooch, as follows:—

"That the Council of Agriculture for England, being convinced that agricultural prosperity cannot be brought about until the social

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needs of the workers, particularly in relation to housing, are fully met, urges the Government to renew the subsidies, without which it is impossible to build rural cottages at rents which farm workers can afford "

was also moved and seconded at the last Council meeting and was referred to the Standing Committee for consideration and report.

2. The Standing Committee has accordingly given further consideration to the whole subject, and, having reviewed the facts available to it, finds itself in agreement with the terms of the resolution referred to it. The Committee is, in fact, fully persuaded that urgent steps are required to be taken in many parts of the country if the agricultural industry is to be adequately served in the matter of houses for agricultural workers.

3. The various enactments to which attention was called in the last Report are of undoubted value in those counties where the task of improving the rural housing situation is being taken up with enthusiasm—not a large number at the present time. There are still many districts in which the young people of the villages are unable to find homes therein, although they wish to continue to get their livelihood on or by the land. Many who may wish to marry and settle down in farm or other rural employment are driven away, first perhaps to a neighbouring town, from which they precariously find means of transport to and from their work, and, later, drift away and seek employment in the cities.

4. We have heard of one district where there is a demand for at least 1,000 new cottages for rural workers in connection with a new development there of the local agricultural industry, and where, when a house has become vacant, there have been as many as 40 applicants for it. This case is probably very exceptional, but we think there are many districts up and down the country where conditions, though less acute, are similar.

5. The importance of a wise employment of the powers of reconditioning rural cottages should not be overlooked by local authorities and owners. These powers provide a supplementary means of meeting a local shortage, though care must be taken to be sure that the houses proposed to be reconditioned are good enough for it.

6. The Committee is aware that the whole subject is now under consideration by a Rural Housing Sub-Committee of the Central Housing Advisory Committee at the Ministry of Health. We look forward to the issue of a report by that Committee with great interest, but in the meantime cannot refrain from venturing to advise the Council that the position over the country is serious, and that nothing short of a wide scheme of assistance by way of subsidy seems likely to be sufficient to improve the position appreciably.

7. It will be within the Council's recollection that various subsidy schemes have been operated since the War, and that the successful ones, so far as the agricultural industry is concerned, have been those where the subsidy was sufficient to make it possible for the local authority to let the cottages at rents which agricultural labourers could afford to pay. These may be reckoned at from 3s. to 4s. a week. It is obvious that, since good cottages cannot be built, except in some specially favoured districts, for less than £800 to £1,000 a pair, an economic rent per cottage based on the capital outlay would be much more than 3s. to 4s. a week.

8. It is suggested that if and when the Government decides upon a subsidy scheme for rural housing, the first step thereafter should be the compilation of a schedule of the districts in which the shortage of agricultural cottages is acute.

9. The Committee considers that it would also be desirable, in working a general subsidy scheme, that besides having regard to the special needs as to suitable cottage designs for each district—an object on the importance

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of which all authorities will agree—special attention should be given to the group-planning of cottages and their being placed at convenient situations so that facilities in respect of water, electric light and heat, may be more efficiently and cheaply supplied. The essential need, however, in any subsidy scheme for agricultural workers' cottages is to ensure that the cottages shall be more commodious and comfortable than have sometimes been considered as suitable in the past, and that they shall be so managed as to make it impossible for them to be tenanted by other families than those whose supporters are, or have been, *bona fide* agricultural workers.

APPENDIX III

Report from the Standing Committee on the Rabbit Problem

1. At the last meeting of the Council (June 19, 1936), Mr. W. Hearle (Cornwall) moved the following resolution :—

"That in view of the fact that wild rabbits have increased to such an extent within recent years as to have become a pest in many parts of the country, the Council urges the Government to prohibit the importation of rabbits for food. It considers that the establishment for a period of a better market for rabbit flesh for food would be likely to cause a rapid diminution in the numbers of wild rabbits."

The resolution was referred to the Standing Committee for consideration and report.

2. Since the meeting, the Committee has taken occasion to examine the subject from several angles, and dealing first with that in the resolution, it finds that the average annual importation of rabbits in recent years is about 400,000 cwt., of which about 90 per cent. are frozen and come from the Dominions, Australia itself supplying about 90 per cent. of the total frozen supply. Of the remainder, i.e., fresh rabbits, more than a half come from Belgium, and the other exporting countries in order of importance are the Irish Free State, Sweden, Holland and Italy. It should be mentioned that the figures of importation of frozen rabbits ran very high during the period 1932-34, then averaging over 500,000 cwt., though since 1934 these have dropped back to about half that figure. The importation for 1935 was 246,190 cwt. frozen and 24,910 cwt. fresh. The corresponding figures for the first ten months of 1936 were 149,827 cwt. frozen and 42,578 cwt. fresh. It will be seen from these figures that while the importation of frozen rabbits is rapidly declining, that of fresh rabbits is on the increase.

3. As against this importation, the estimate of marketed home production, as obtained from information available as to the numbers of rabbit pelts marketed, amounts to about 1,000,000 cwt. For the most part, these home supplies are presented on the market ungraded and in small lots and do not therefore always command the price they should. They do not, of course, compare with certain grades of imported fresh rabbits, e.g., Ostend and other kinds, which are specially produced to meet a high-class trade on our market. The large supply of frozen rabbits are also well graded and are able to be handled so as to be held in cold store and put on the market only when there is a demand for cheap meat of the kind. They find a ready sale at a low price in London and other large cities and towns when they are required to supply a shortage of cheaper meats or of English wild rabbits.

4. Considering the position as a whole, therefore, it is not clear that if increased supplies of home-killed rabbits were brought upon the market

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in their present ungraded state the public would readily purchase them in place of the regulated and graded supplies from abroad, (i) of fresh rabbits, Ostend, etc.; (ii) of frozen rabbits. The Committee, therefore, is not prepared to advocate the prohibition of imports as suggested in the resolution. The position would be different if wild rabbits were, to any considerable extent, produced or "farmed" in this country on commercial lines and marketed in graded qualities, and the trade well organized and backed by an efficient system of cold storage. As it is, the Committee considers that where the rabbit is a definite pest, farmers should treat it as such, and get rid of it without any incentive of a better market price.

5. As regards methods of destruction, the Committee has considered these from the point of view of effectiveness, and of acceptability to the farming community. Gassing of rabbits on such sites as are suitable for the operation may be the most effective, but apart from the question of whether the meat would be unfit for human food, we question whether farmers would ever be likely to prefer it to the other and more usual methods. The best of these appear to be long-netting, snaring, and ferreting and shooting, though it should be noted that the value of shot rabbits on the market is usually less than of those taken by other means. Whatever the method, or methods, adopted, however, the Committee considers that if they can be carried out as a regular routine on every farm as soon as too many rabbits are in evidence, there would be little likelihood of much further trouble.

6. As regards the general question of rabbit destruction, the Standing Committee understands that this is under consideration by a Committee of the House of Lords, and does not feel called upon to go into it in detail in this Report. Speaking generally, however, the Committee would observe that it is probably undesirable to do anything that would prevent an occupier of land keeping up his rabbits if he wishes to do so where they are not a nuisance to others. There are many districts where the rabbit is not a pest, and others where very large numbers are bred and annually reduced to reasonable bounds by trapping, to the financial benefit of the owners. A point as to steel traps; the Committee would like to see it made illegal for steel traps to be set anywhere except underground or under cover, by anyone.

7. The Rabbits Bill, 1930, proposed that County Councils should be given powers to enter on land and reduce the numbers of rabbits where they were causing or likely to cause damage to adjoining properties, in cases where the owner did not himself carry out the work when asked to do so by the Council. The Committee considers that an Act on these lines would undoubtedly be useful, though great care would have to be taken in exercising the powers so as to avoid damage to game and game coverts.

APPENDIX IV

Report from the Standing Committee on the Liming of Land

i. The attention of the Standing Committee has been drawn to the fact that the periodic liming of land is not now being carried out in many parts of the country where the soils require it in order to help them to produce the maximum crops of which the land is capable. The same general complaint appears to have been made about twelve years ago to the Ministry of Agriculture, which then put forward a scheme for assisting farmers in the matter. That scheme was dependent on the exercise by farmers of the powers given to them under the Agricultural Credits Act, 1923, to obtain loans at cheap rates under the Act, after forming themselves

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into associations for the purpose. Such associations could purchase lime in bulk on the credit obtained under the Act. The interest payable on loans at the start of the scheme was 4 per cent., and a period was allowed for repayment of principal and interest, longer or shorter according to the quantity of lime used per acre.

2. That scheme was not, however, taken up by farmers to any appreciable extent, and the Agricultural Credits Act, 1923, was later superseded by the Agricultural Credits Act, 1928, which had quite different provisions. Under the latter Act, owners of land can borrow money on long-term rates from the Agricultural Mortgage Corporation, or a tenant can raise money on the security of his stock and crops. Whether any capital needed for liming operations is to-day being borrowed under this Act is a matter on which we can obtain no definite information, as particulars of the purposes for which loans are obtained from banks, etc., are not available, but we think it is unlikely that much is being borrowed for liming.

3. Another series of Acts which it was thought might be made to assist liming is that of the Improvement of Lands Acts, under which the Lands Improvement Company (and the Agricultural Mortgage Corporation) are empowered to lend money to landowners at cheap rates for specified works on farms or estates. These specified works do not include liming. On inquiry, we find that the operation of liming, being usually a tenant's job, was not included as a fit subject for a landlord's loan. We consider, however, that it would be a great advantage if it could be included. If it were, the loan would presumably have to be to the landlord, who in the case of a rented farm could be recouped by the tenant paying him an agreed temporary increase in rent to cover the cost of the liming. Few landowners would be averse to co-operating in a scheme of this sort, which, besides being of benefit to their tenants, would undoubtedly add to the value of their land. If it were a man's own farm, then there seems to be every reason why the Company should be enabled to lend money to meet the cost of this exceptional and important agricultural operation. The Standing Committee suggests that the Ministry of Agriculture and Fisheries might be asked to look into the matter of this legal shortcoming with a view to its amendment.

4. Further, the Committee suggests that the Ministry should also be invited, at the present juncture, to undertake a wide scheme of propaganda in favour of liming. Local Authorities and their Agricultural officers might be asked to give it special attention, and the Ministry might consider whether it could not, as a matter of urgency not unconnected with a Defence policy, acquire means to assist owners and tenants in special cases, (i) by way of helping to secure reductions in transport rates for lime where these are unduly heavy, and (ii) by lending Government money from a special fund to be created for the purpose in cases where the County Agricultural Organizer could certify that a farmer was for some stated reason without ability to borrow money for liming under the existing Acts; the amount so required would probably be small, but the effect of the existence of such a provision would, the Committee thinks, be of considerable propaganda value.

APPENDIX V

Report from the Standing Committee on the Report referred back from the last Council Meeting on the Tuberculin Test for Imported Cattle

1. The Report dated June 4, 1936, of which a copy is attached, was referred back to the Standing Committee for further consideration at the

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last meeting of the Council (June 19, 1936). The suggestion was that what was required was the testing of *breeding* cattle before export from Ireland, in the same way as cattle sent abroad from this country had to be tuberculin tested, and, further, that the single tuberculin test might be of some assistance in reducing the proportion of infected animals.

2. The Standing Committee went again into the whole question with a view to seeing whether some method could not be found which might be recommended to authority on the lines of dealing with part only of the imported breeding stock. The Committee were unsuccessful. It should be realized that over 40 per cent. of the bovine animals imported from Ireland come within the category of animals fit for breeding, which means that approximately 350,000 cattle are under consideration. To pass these animals through a single tuberculin test, would mean adding to their cost, and would involve setting up a heavy piece of administrative machinery with no very useful purpose gained. The animals, as soon as they come to this country are mixed with the ordinary herds and would, if they were free from tuberculosis before, become liable to immediate infection. As regards the comparison with cattle sent abroad, these animals cannot be considered as requiring similar conditions of export to the comparatively few pedigree cattle which are sent from England to countries abroad which are either free or nearly free from tuberculosis, and require that high-priced imported animals shall be free from the disease.

3. The general position, therefore, is as indicated in the previous Report of the Standing Committee attached. Because of the present incidence of tuberculosis in this country, it would be anomalous to attempt any general scheme of eradication or reduction on the basis of elimination of cattle in home herds found to react to the tuberculin test. Since that is so, it could not reasonably be suggested for store cattle from Ireland unless these cattle were known to be virulently infected with tuberculosis. That is not the case, and further, the Committee, having made certain inquiries as to the steps taken both in Northern Ireland and the Irish Free State to reduce bovine tuberculosis, are satisfied that these efforts are not less than those proceeding in this country under the Tuberculosis Order and by the voluntary establishment here of attested herds, i.e., herds officially declared after testing to be entirely free from tuberculosis, which, incidentally, are fully protected against infection from newly-introduced animals, whether home-bred or imported. The position would be entirely different if a majority of the herds of this country were attested.

Copy of Report from the Standing Committee on the Question of Tuberculin Test for Imported Cattle, dated June 4, 1936

1. At the last meeting of the Council (December 12, 1935) a resolution, moved by Mr. D. G. Watkins (Hereford) to the effect that all cattle entering this country from foreign ports should be subjected to tuberculin testing, was referred to the Standing Committee for consideration and report.

2. The position is that apart from special consignments of pedigree cattle, the importation of cattle from countries outside Great Britain is either prohibited or confined to those animals intended for slaughter at the port of landing, except in the case of cattle from *Canada*, the *Channel Islands* and *Ireland*.

3. So far as *Canada* is concerned, breeding cattle are always subjected to the tuberculin test before shipment : that is by Canadian Order. Cattle incapable of breeding are in most cases imported as fat for slaughter.

4. As regards the *Channel Islands*, the Islands are free from tuberculosis.

5. As regards *Ireland*, in 1935 there were 851,340 cattle imported, of which 213,440 only were fat, the remainder (637,900) being stores distributed to farms. Tuberculosis may be reckoned to be about as prevalent

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among cattle in Great Britain as it is in Ireland, and the limitation of imports to cattle from Ireland which had passed the test would reduce the available supply of store cattle below the needs of this country, and might raise the price of stores to a prohibitive figure. No compensating advantage could be looked for from such limitation because, in view of the prevalence of tuberculosis in this country, imported cattle, even if certified free from that disease on entry, might easily become infected again by contact with other cattle. There is the further point that a single tuberculin test could give no guarantee that the animal was free from disease. A second negative test, after an incubation period of at least 60 days *in isolation*, would be necessary to detect animals which were in the incubative stage of tuberculosis. Apart, therefore, from the consideration that testing before entry would be likely to serve no useful purpose, its cost would probably be such as to make it commercially impracticable.

APPENDIX VI

Report from the Standing Committee : the Government's Live Stock Industry Bill

1. As the Council is aware, the Standing Committee has for some years past kept in close touch with the developments in the live stock industry and has watched the effect of Government measures in connexion with that industry. A brief summary of its activities is here stated so that the Council can have the full picture before them.

2. In January, 1928, the Standing Committee reported to the Council that the existing methods in regard to the sale of home-grown live stock and meat were unsatisfactory and as a rule operated seriously against the interests of farmers, farmers were too much in the hands of dealers and auctioneers; and that selling cattle by live-weight should be universal instead of being employed only at some markets. It added that there were too many small markets dominated by a few dealers, and better prices would be secured if business were concentrated in the large auction marts. It favoured the co-operative sale of cattle, and the co-operative slaughter and sale of dead meat on behalf of the producer. It recommended that there should be a general grading up of the livestock produced on farms, starting with the elimination of the scrub bull. The farmer was advised to breed carefully for the modern beef market, which required smaller joints and smaller cuts of high quality beef. More cold storage was advocated to hold surplus supplies of home-killed beef off the market and to allow of longer hanging in order to bring these supplies into the right condition for consumption. The Committee shared the views expressed by many farmers that the margins between producers' and consumers' prices were unjustifiably wide and that the margins had tended to increase in recent times. It recommended that the attention of the Ministry and the Food Council should be again directed to the meat position.

3. At the end of 1928, the Committee returned to the subject in a Report presented to the Council and adopted by it in December of that year. It urged an early improvement of the live stock position, recommending :—

- (i) A system of grading fat cattle into three grades on presentation at the market.
- (ii) Co-operative slaughter for stock and grading as to actual quality of meat before sale on behalf of the farmer.

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- (iii) The overhauling and systematizing of the organization of markets, with the elimination of the smaller markets and the division of stock more evenly and proportionately.
 - (iv) Improvement of the system of market intelligence.
 - (v) Growing more cattle foodstuffs on farms and any other measures which would be likely to even out the customary rush of cattle on the autumn market, leading invariably to decline in prices.
 - (vi) The grading and marking of beef in the three grades of the National Mark in order to differentiate it from Scotch, Argentine and other imported meat, and from ungraded English meat.
4. The Standing Committee again reported to the Council in December, 1933, stating the urgent need that then existed for Government action to obtain improved prices of British beef, the grazier's position being then desperate. The Report of the Reorganization Commission on beef marketing was then being awaited.

5. In June, 1934, the Committee obtained the Council's agreement to its views on the Reorganization Commission's Report. The principal of these were that it found that about 47 per cent. of the cattle which were both fattened and slaughtered in England and Wales were cows and bulls, and not good quality beef cattle, and it could not approve of the presentation to consumers of such high and increasing proportion of inferior grades of beef without any system whatever of distinguishing the meat of it from that of the many good class (non-National Mark) steers and heifers specially bred and fattened for the beef market. A proper marking of beef scheme would be helped if cattle were killed at central abattoirs, rather than at private slaughter-houses. If the Government's proposal subsequently made in the White Paper on the live stock situation (Cmd. 4651), dated July, 1934, as to levy on imported cattle and subsidy on home-produced beef, were adopted, the subsidy should be on a differential basis according to quality.

6. In July, 1934, the Cattle Industry (Emergency Provisions) Act of that year was passed, which introduced the 5s. subsidy per cwt. live-weight on the market sale of all fat cattle reaching a prescribed standard of quality.

7. In December, 1934, the Standing Committee reported congratulating the Cattle Committee on the working of the Cattle Industry (Emergency Provisions) Act, 1934, up to date, adding that it felt confident that if the Government were able to proceed with success on the lines mapped out in the White Paper (Cmd. 4651), the industry would revive and flourish.

8. In the Report in December, 1935, on the Ministry's scheme for the grading and sale of fat cattle by dead-weight, operated by the Ministry's graders through a few central markets (the number of which the Committee thought should be increased) the Committee said that the very severe strain on producers through uneconomic prices still continued, and it expressed the hope that the remaining stages of the meat negotiations with the Dominions and foreign countries would be carried through with the utmost possible speed in order that the industry might be restored to a healthy position without further delay.

9. It is true to say that the live stock industry is still to-day in a most serious position. Prices are lower than they were in December, 1934, when we had to report that the great strain on producers through uneconomic prices still continued. Since that time the live stock industry has struggled on in the hope of the market righting itself, and had it not been for the cattle subsidy of 5s. per live cwt. disaster must have overtaken it. The industry, in trying to adjust itself to the situation, has suffered injury through (i) losing still more of its beef producers who have been

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forced into other branches of agriculture, e.g., milk production, and (ii) a decline in the quality of beef produced.

10. The Committee now welcomes the Government's policy defined in the statement made by Mr. Walter Elliot in the House on July 6 last as involving the policy of a regulated market with maximum supplies of meat for the consumer consistent with a reasonable level of remuneration for the producer : the market to be regulated so far as overseas supplies are concerned by an International Meat Conference, representative of the United Kingdom, other Empire countries, and those foreign countries which supply substantial quantities of meat to the market : customs duties to be levied on imports of chilled, frozen and other descriptions of beef and veal from foreign countries : the subsidy paid to producers of fat cattle in the United Kingdom to the increased amount of £5 million per annum until such time as the conditions prevailing in the industry improve. As a precautionary measure, the Minister added that the Government would ask Parliament to give them general power to regulate imports of live stock and meat should the need arise.

11. Since that announcement was made, a Live Stock Industry Bill has been prepared, as to which the Standing Committee has, on certain essential points such as the method of payment of the extra quality subsidy, the regulation of markets, and central slaughtering, been informed and consulted from time to time. The Bill has not at this date been published and the Committee is unable therefore to comment in detail upon it, except to say that it thinks the measure is one likely to prove of great value to the industry in that, on the one hand it proposes substantial benefits in the shape of increased subsidies for good quality home-produced fat cattle, makes provision for their being well marketed in the producer's interest, and proposes certain general benefits for the industry through rationalization of internal markets, slaughter-houses, and for better business organization in the industry generally. On the other hand, the measure includes machinery to restrict overseas supplies so that the home market will not be unduly prejudiced. Another Bill is, we understand, to be proposed to deal with the financial provisions for the levy on foreign chilled and frozen beef and veal. The Committee proposes to make a further Report to the Council on the details of the measure when they are published, and it would not hesitate, if it felt it advisable in the public interest, to call a special meeting of the Council to consider and discuss that measure alone.

JANUARY ON THE FARM

E. J. ROBERTS, M.A., M.Sc.

Retrospect. From a farmer's standpoint the results of most years can be viewed with mixed feelings, and 1936 is no exception. On the whole, agricultural produce realized better prices, as can be seen from the Price Index of agricultural produce published monthly in this JOURNAL; feeding stuffs, however, were dearer from the end of summer, creating a difficult situation following the disastrous hay harvest. Milk not only realized rather better prices, but, owing to the abundance of grass, was produced more cheaply and in greater quantities in the grass season of 1936 than in the previous year. Against this, however, must be set the late start, with almost no growth of grass in April. In a discussion recently with a few dairy farmers, the opinion was expressed that udder troubles have rarely been so frequent as in 1936; milking machines have been blamed in some instances, but, on further inquiry, one finds that neighbouring herds where hand milking is practised are affected to the same extent.

Although the prices for fat cattle have not differed much from those of last year, the cattle have cost more as stores. It is encouraging for breeders, however, to observe a slight improvement in the prices for store cattle, since this gives reason for hoping that some of the subsidy is indirectly reaching raisers of such cattle. Very little of the beef subsidy goes directly to the store cattle areas; thus, in the six months March-August inclusive, only 31,466 cattle were approved for subsidy in the whole of Wales, while four times this number were approved in the northern counties of England. In some areas where store cattle are raised, breeders have attempted to right the situation by finishing the cattle that they normally sell as stores. Although the prices of finished cattle have been so low in the past three years, it is satisfactory to learn from the recently issued report of the Imperial Economic Committee ("Meat," H.M. Stationery Office) that the proportion of home-produced beef and veal increased from 48 per cent. in 1929 to 52 per cent. in 1935.

Sheep prices have constituted the brightest spot in the past

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year's farming transactions; there is, however, an uneasy feeling in some quarters that the interest in our breeds of sheep shown by lamb-exporting countries may make this a short-lived prosperity. One result of the brisk demand for fat lambs has been the ease of disposing of the heavier types compared with a few years ago. One would not, however, be true to agricultural tradition, if a bright spot were mentioned without referring to some counter-balancing difficulty. The wet summer has been responsible for a heavy increase in losses from the nostril fly and from pneumonia following infestation with lung worms; a very severe form of foot-rot is also prevalent.

The better prices of pig-meat in the later months of the year made 1936 a rather better year for receipts than 1935, though the increased prices of feeding stuffs robbed the producers of much of the advantage. In the report of the Imperial Economic Committee, referred to above, it is stated that home-produced pig-meat accounted for half our consumption in 1935, against 39 per cent. in 1929—an increase that amounted to 2·75 million cwt. It is probable that this proportion was maintained in 1936.

Horse breeding has enjoyed another favourable year. Prospects are rosy; the demand for foals was a feature of the autumn sales, there being an advance in prices and an increase in the numbers sold. The Shire Horse Society, up to September, registered 286 stallions and 938 females, against 251 stallions and 826 females for the previous year. As regards the threat from foreign horses, Major James Paterson, of the transport firm of Carter, Paterson & Co., reporting some experiences with Polish and Russian horses to the National Horse Association, remarked that, in the general opinion of horse users, British bred horses are superior in lasting qualities where the pace is fast or the surface hard. Imported animals are of hardy constitution and are temperamentally docile, but their bone is not so hard, and foot troubles arise from the fact that concussion renders them more subject to ring and side-bone.

In crop production, the unfavourable harvest weather constitutes the predominant feature of the year. In the hay harvest, the crop was not only difficult to get, but on many farms much had to be burnt, particularly in the Midlands, where two or three dry days in succession were rare. At the Leicester City Corporation farms, the rainfall amounted to

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4·40 in. and 5·33 in. for June and July respectively, against 2·53 in. and 0·92 in. in the same months of 1935. There was more hay-making than harvesting of corn in August in many districts, second cuts being taken. It is generally believed that, though the weather may be good, August hay is of inferior quality; according to chemical composition, however, as shown by Woodman and by Fagan, August hay from a properly managed sward should be very little inferior to June hay.

The corn harvest proved to be as disappointing as the hay harvest, and the crops remained in the stooks in many districts twice or thrice as long as usual. The actual fall of rain was not so heavy, but showers seemed to arrive as soon as the corn was ready for loading; thus, in August, the fall of rain was less than 1 in. at Leicester, and only 1·36 in. at Bangor. A year ago there were many reports of wet corn stacks at threshing time, caused by the prolonged rain, and, perhaps, careless stacking, after a good harvest. This year there are some reports of poor coloured corn following the wet harvest; those with graindriers feel pleased with their investment. On the whole, however, there is satisfaction, though in some districts it is said that crops that looked heavy have threshed out disappointingly. A grower on a mechanized farm in Bedfordshire describes 1936 as the worst year he has known.

Sugar-beet. Some of the land intended for beet has had farmyard manure and a deep ploughing by this time, though much of this will be done this month, weather permitting. The ploughing should be as deep as possible, 12 in. being a suitable depth. The farmyard manure should be ploughed in during winter, or, at latest, in early spring; late applications not only mean late ploughing with the possibility of burying a good frost-made tilth, but may also result in a number of fangy roots.

The value of beet tops is well appreciated and is estimated at from 50s. to 100s. per acre. A correspondent writing in *The Scottish Farmer* (March 14, 1936) stated that, on the tops from 27 acres, he had fed 400 hoggets, maintained 75 cross-bred ewes, and 60 head of cattle from October to the middle of January. In his experience, it was difficult to find turnips good enough to keep the sheep going on should they not be finished on the sugar-beet tops.

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Manuring of Meadows. Applications of manures other than quick-acting nitrogenous manures are made during the winter. If slag is to be applied, this should be done as early as possible. Farmyard manure should be spread before the end of February, since a late application—particularly in a dry spring—results in much of the manure being held in the sward. Farmyard manure, well spread in good time, can be relied upon to give good results. In an experiment that has been continued for over ten years at the College Farm at Bangor, this manure, applied annually, has given yields of meadow hay consistently higher than any combination of artificials, without any deterioration occurring in the quality of the crop. It must, however, be added that, both in spring up to the end of April, and again in autumn, the plots are grazed very closely by mountain sheep. The following average yields per acre were obtained for the years 1924-36 (excluding 1933) from the annual applications of the manures specified:—

	<i>cwt.</i>
Farmyard manure	39½
Slag alone	26½
Complete artificials	35¾
Complete artificials, minus potash	30
Complete artificials, minus phosphate	36½
Complete artificials, minus nitrogen	35½
No manure	29½

The experiment provided many surprises. The diminution in yield caused by the annual dressings of about 6 cwt. slag, no reduction in yield by the omission of nitrogen, or of phosphate, and the obvious response to potash, in view of the heavy character of the soil, were unexpected results. Perhaps the most striking lesson drawn from this experiment is the importance of farmers carrying out small trials, and not to assume that the requirements of crops by all fields follow certain general rules.

Ordering Seed. The rush to order seed for spring wheat will not be so great this year as last year, when the autumn sowing was interrupted by the continued rain. In view of the general opinion as to the failings of spring wheats it is interesting to recall that, at the last Cambridge and Isle of Ely Grain Exhibition, the first prize for milling wheats was won by a Suffolk grower with April sown Mars de Suede. The crop followed roots folded off by sheep and was badly laid. The

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variety is a strong wheat, but was neither a good yielder nor strong in the straw. The better known varieties are Red Marvel and April Bearded; the N.I.A.B. has recommended Little Joss for sowing before the middle of February, Red Marvel from that time to the middle of March, and April Bearded for drilling after that.

Many will also be ordering barley this month. Some growers of malting barley believe in sowing in February where possible; in some counties, Essex in particular, much of the malting barley is even sown in the autumn.

Shelter for Ewes and Lambs. Although breeds of sheep differ so much in ability to withstand wet, cold conditions, a certain amount of shelter is essential to even the hardiest just at lambing. Even a vigorous, well-covered lamb may be quickly rendered helpless if it is exposed to cold rain immediately after birth. Arable flocks are not hardy, and, in addition, are folded on large, open fields. The pens, either permanent or temporary, provide the necessary shelter for such flocks. With grass flocks, hedges, irregularities in the surface, or woods are often the only shelter; where there is no such natural shelter, as on the Romney Marsh, a few hurdles are all that may be provided. Shelter belts of trees are of great value, and in the leases of some farms with such woodland there is often a covenant by which the landlord undertakes to replace any trees felled. There are fine examples of shelter belts on the Cotswolds, and from now until the warmer weather many flocks may be seen getting the benefit of such wind-breaks. An excellent shelter of this sort may be seen near the Sutton Scotney to Stockbridge road in Hampshire; this wind-break consists of a long wood, with transverse plantations at intervals. One of the disadvantages of the breaking-up of estates consists in the cessation of planting such wind-breaks. Some farmers, however, contend that, invaluable as they are for stock, they have the disadvantage of harbouring rabbits and pigeons.

NOTES ON MANURING

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The Place of Fertilizers in Grass Land Management.

Any measures for the improvement of grass land by the application of lime or mineral manures are usually put into effect during the autumn and winter, so there is little time left to carry out any improvement contemplated for the coming season. Grass land can be highly productive if it is properly managed and adequately fertilized, but, in the absence of proper care and attention, its productivity may fall to a very low level.

The standard of production on any particular farm is inevitably bound up with the potential means of utilizing the produce, whether as grazing, hay, or conserved for sale or winter use in the form of silage. There is obviously little point in spending money on fertilizers to produce grass for stock that are losing money. It is equally useless to attempt to maintain an improved sward unless it is stocked to full capacity or the produce is removed as necessary and conserved for future use. Understocking, in the absence of systematic cutting, is invariably the first step towards pasture deterioration, and no adjustment in the manuring policy can prevent this.

Whether or not the maintenance of his grass land at a higher level of productivity will be an economic proposition is for the farmer himself to decide. He alone knows whether he has the capital required for heavier stocking, and whether the stock, or any other means he may have of disposing of the increased produce, is likely to leave a profit. On the other hand, there are fields on which production of herbage is at a high level, but an improvement in quality may be desired. Application of manures may influence both the type of herbage, as will be shown later, and the mineral constituents such as calcium and phosphorus contained in the herbage. These mineral constituents are of great importance to rearing stock and milch cows, which cannot thrive or maintain their rates of production on herbage deficient in minerals. It is important, therefore, to look at the problem not only from the standpoint of yield of herbage, but with reference to the suitability of the herbage to supply the needs of the stock it is intended to support.

Gradual awakening to the possibilities of the value of grass as a food for stock, and the increased productivity that can

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be brought about by proper attention to the management of grass land, have resulted in a tremendous expansion in the investigational work on this question. What fertilizer to use, when to use it, and in what quantity it should be applied, are no longer regarded as the chief problems in grass land management. Indeed, though fertilizer applications can do much to ensure a satisfactory amount of good quality herbage, other points in management, especially the density and periods of stocking, have frequently a much more immediate and pronounced effect on the productivity of a pasture. The complexity of the problem is apparent from the vast amount of information that has been published during the last ten years—from Aberystwyth on seeding, management and botanical problems; from Cambridge on the composition, digestibility and feeding value of pasture grass; and from a number of other centres dealing with the application of these problems under local conditions, and with such allied problems as the conservation of young grass by artificial drying or ensilage.

In recent years, opinions as to the relative importance of the various operations that constitute grass land management have changed considerably. Herbage species, cultivations, stocking and manuring, all play an important part. In these notes we are primarily concerned with manuring, but it must be remembered that the application of any manure has a direct influence on the herbage species, e.g., basic slag is usually held to encourage the spread of wild white clover, while frequent doses of sulphate of ammonia tend to decrease the proportion of that species. With either dressing, however, the final effect of the fertilizer may be modified by a change in the grazing policy; the increase in clover, following the application of the slag, will be less if the first grazing is deliberately delayed and the pasture is allowed to grow away in the spring, while on the other hand, close grazing may mitigate the reduction in clover consequent on the application of sulphate of ammonia.

What then should be the policy of the farmer who wants his pastures to provide as much grazing as possible over the longest period of the year. In the long run, the soundest policy is usually to maintain between grasses and clovers a balance that will give the bulk and quality of herbage nearest to the requirements of the stock it is proposed to carry. The way in which manures can help to achieve this result

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can best be judged from an appreciation of the effects likely to be produced by the various types of fertilizer. These can only be summarized very briefly in these notes—it is for the individual farmer to apply these general principles to the conditions and requirements of his own farm.

Manuring Pastures. For a poor, worn-out pasture a light dressing of short, well-rotted *farmyard manure* is invaluable. In other circumstances, however, farmyard manure can generally be used to greater advantage on the arable land or the hay crop.

The importance of *lime* is sometimes questioned, but, though it is often possible to avoid the necessity for applications of lime by the use of basic slag as the phosphatic fertilizer, there are many occasions when it is better, in the long-run, to apply lime. Lime deficiency so often brings in its train a variety of other troubles that it rarely pays to ignore it. The lime must be worked into the soil. In a system of alternate husbandry this is easy if the lime is applied for one of the arable crops, but, on old pastures, reliance has to be placed on severe harrowing.

An application of a *phosphatic* fertilizer often produces very striking results on old pasture. The chief effect is the well-recognized increase in the wild white clover in the herbage, which, in turn, will exercise a beneficial effect on the grasses if the grazing is properly controlled. Of the various types of phosphatic fertilizer, *superphosphate* is most useful on dry, sandy and chalky soils, whilst *ground mineral phosphate or rock phosphate* can be used to best advantage on acid soils under conditions of high rainfall. In such circumstances, ground mineral phosphate will often act as quickly as the low-soluble types of basic slag, provided it is really *finely ground*. On the great bulk of our pastures, however, *basic slag* seems to be the best choice.

The recent introduction of new grades of *basic slag* has caused confusion in the minds of some farmers as to the basis on which different types should be compared. It is, however, still true to say that citric-solubility affords a fair guide to the availability of the phosphate in the slag. Although this figure is not always included in quotations, it will usually be supplied on request. A sample with a citric-solubility of 80 per cent. or over will usually prove fairly quick in action, and should always be used where an early response is desired, or where conditions tend to be unfavourable to the efficiency

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of fertilizers that are not water-soluble. The less-soluble types of slag can frequently be used with success on the heavier and wetter types of soil, but, under dry conditions, such as on the light soils in the east of England, high-soluble slags are usually the wisest choice. An application of basic slag should always be accompanied by some mechanical treatment, usually harrowing. In the absence of such treatment response to the slag may be slow. The severity of the harrowing should be determined by the turf itself—the more rough patches there are and the greater the accumulation of undecayed mat, the more severe should be the harrowing. One other point is worth remembering when using basic slag, namely, for pasture that has not recently received a phosphatic fertilizer, the initial dose should be heavy; the equivalent of 8 to 10 cwt. per acre of a slag containing 14 per cent. P_2O_5 , in one dose, will usually give better results than the same quantity applied in, say, two separate doses. Subsequently, 4 to 5 cwt. per acre every three years should suffice. Instances have recently been recorded in which, on very poor grazings, even heavier initial doses were necessary; such instances, however, are usually on land that is in exceptionally low condition, and that frequently requires some other treatment, such as a seeding of wild white clover, before even the heavier dressings of slag will produce much improvement in the herbage.

The need for *potash* fertilizers on pasture land is more difficult to define. Potash is usually required on chalky, peaty and sandy soils, and any failure to get a response from phosphatic fertilizers should be followed by a trial dressing of some potash fertilizer. There is little to choose between the various types of potash fertilizer so far as their use on grass land is concerned. The cheapest per unit will generally serve just as well as the more expensive ones.

The use of *nitrogenous* fertilizers on pasture land is still not common in this country, and, so far, has been largely confined to "rotational grazing" or to encouraging the growth of herbage at special seasons of the year, points which will be dealt with in a future note.

Manuring Meadows. To produce a bulky crop of hay, nitrogen in some form is essential. There is nothing to beat *farmyard manure* for meadow land, provided it is used in reasonable amounts. Heavy annual dressings of dung alone, however, are the surest way to a weedy sward and rank,

NOTES ON MANURING

rather unpalatable, herbage—not infrequently found in the past on small grass farms devoted almost entirely to milk production. The balance and quality of the sward can only be maintained by supplementing the farmyard manure with adequate amounts of *lime* and *mineral fertilizers*. Where farmyard manure is available, the soundest policy is to give a good dressing every third year. Superphosphate or high-soluble basic slag, equivalent to about 5 cwt. per acre of a 14 per cent. P_2O_5 grade, should be given in one of the two intervening years, together with potash where necessary. A small dressing of nitrogenous fertilizer can be used in years when dung is not given, if growth is not satisfactory. Even with unlimited supplies of dung, it is not wise to use it more often than once in two years, and a phosphatic fertilizer, with potash where necessary, should then be given in the intervening years. Meadow land should be more liberally treated with potash than pasture land, though the need for potash is less when dung is used.

In the absence of regular dressings of dung, meadow land should receive adequate treatment with artificial fertilizers. This will obviously vary from farm to farm, but a suitable sort of treatment would often be 6 cwt. basic slag (14 per cent. P_2O_5) and 2-3 cwt. 30-per-cent. potash salts per acre, every third year, in conjunction with an annual spring dressing of $\frac{1}{2}$ cwt. per acre nitro-chalk. Alternatively, about 4 cwt. per acre of a complete mixture should be applied each spring, e.g. 2 cwt. superphosphate; $\frac{1}{2}$ cwt. sulphate of ammonia and $\frac{1}{2}$ cwt. muriate of potash.

The use of lime on meadows is even more important than on pastures. It makes for good quality hay, and, on soils that show any tendency to become acid, about 10 cwt. per acre of burnt lime, or its equivalent, should be given every three years. Lime is particularly important on land that receives regular dressings of dung, but the two should not be applied in the same season.

The above recommendations for meadow land can be used as the basis of a definite manuring policy on the lines already advocated for arable crops. The adoption of such a policy would automatically solve what is an annual problem on many farms, namely, by what means and to what extent meadows shall be, or can be, temporarily stimulated. It would also ensure that the maximum benefit would be obtained from applications of dung.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton (2,240 lb.) during week ended Dec. 16.					Cost per Unit $\frac{1}{q}$
	Bristol	Hull	L'pool	London		
Nitrate of Soda (N. 15½%) ..	£ s.	£ s.	£ s.	£ s.	s. d.	
" " Granulated (N. 16%) ..	7 12d	7 12d	7 12d	7 12d	9 10	
Nitrate of Lime (N. 13%) ..	7 od	7 od	7 od	7 od	9 6	
Nitro-Chalk (N. 15½%)	7 5d	7 5d	7 5d	7 5d	10 9	
Sulphate of Ammonia :—						
Neutral (N. 20·6%)	7 od	7 od	7 od	7 od	6 10	
Calcium Cyanamide (N. 20·6%)	7 oe	7 oe	7 oe	7 oe	6 10	
Kainite (Pot. 14%)	2 18	2 15	2 15	2 15	3 11	
Potash Salts (Pot. 30%) ..	5 0	4 17	4 15	4 17	3 3	
(Pot. 20%)	3 15	3 12	3 12	3 12	3 7	
Muriate of Potash (Pot. 50%) ..	8 3	8 1	7 17	8 1	3 3	
Sulphate .. (Pot. 48%) ..	9 15	9 13	9 9	9 13	4 0	
Basic Slag (P.A. 15½%) ..	2 10c	2 0c	..	2 6c	2 11	
(P.A. 14%)	2 6c	1 16c	1 16c	2 3c	3 1	
Grd. Rock Phosphate (P.A. 26½%)	2 10d	2 5d	2 10d	2 5d	1 8	
Superphosphate (S.P.A. 16%) ..	2 19	..	2 19f	2 16g	3 6	
(S.P.A. 13½%)	2 15	2 13	2 15f	2 12g	3 10	
Bone Meal (N. 3½%, P.A. 20½%)	..	6 10	6 5h	6 10	..	
Steamed Bone Flour (N. 4%, P.A. 27½—29½%)	5 12	5 10	5 oh	5 0	..	

Abbreviations : N = Nitrogen ; P.A. = Phosphoric Acid ;
S.P.A. = Soluble Phosphoric Acid ; Pot. = Potash

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station unless otherwise stated. Unit values are calculated on carriage-paid prices

§ Prices are for not less than 2-ton lots, nett cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. prices.

a Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

c Prices for 6-ton lots At Bristol, f.o.r. Bridgwater ; at Hull and Liverpool, f.o.r. neighbouring works, and at London, f.o.r. depots in London district. Fineness 80% through standard sieve

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra ; for lots of 2 tons and under 4 tons, 5s. per ton extra ; and for lots of 1 ton and under 2 tons, 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station For lots of 2 tons and under 4 tons, the price is 5s. per ton extra ; for lots of 1 ton and under 2 tons, 10s. per ton extra ; for lots of 10 cwt. and under 1 ton, 15s. extra ; and for lots of less than 10 cwt. but not less than 2 cwt., 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails ; southern rails 1s. 3d. extra.

h Prices shown are f.o.r. Appleby Bridge.

¶ These are calculated by regarding a ton as comprising 100 " units " (equal parts of 22·4 lb.) so that a fertilizer, for example, with 16 per cent. nitrogen, contains 16 such " units " in a ton. Then, if the price per ton of such a fertilizer be divided by the percentage figure, the deduced cost is that of a " unit " of that agent. Those in the table above are based on London prices. (For further explanation, see Advisory Leaflet No. 146, "The Valuation of Artificial Manures," obtainable from the Ministry, free of charge.)

NOTES ON FEEDING

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Mineral Supply. The fact that the animal body and animal products contain mineral ingredients, the supply of which must be covered by the food, has been brought into prominence in recent years through the repeated demonstration that many cases of unsatisfactory progress or even ill-health under practical farm conditions are directly traceable to mineral deficiencies. The realization of this fact has developed a tendency, however, towards the indiscriminate addition of minerals to rations without any consideration as to whether such addition is necessary or desirable. It is certain that in many instances such additions have had detrimental effects, these having been due in some instances to the creation of an actual excess of minerals and in others to the establishment of an unfavourable balance between the individual mineral elements. The proper use of mineral supplements can thus clearly only be based upon a knowledge of the mineral content of the foodstuffs included in the ration, and of the mineral requirements of the class of animal to which it is to be given.

The subject is too complex to permit of more than a few of the major features being touched upon here, since many mineral elements enter into the composition of the animal body, the chief being potassium, sodium, calcium, magnesium, iron, phosphorus, sulphur, silicon, chlorine and iodine. Varying amounts of each of these elements are lost from the body day by day in the dung and urine, whilst further loss takes place if products such as milk or eggs are being removed. Should the supplies in the food be inadequate to cover these losses the deficiency must be made up from the substance of the body itself, a procedure that is clearly undesirable, and, if persisted in, must inevitably become deleterious to progress and health.

In practice, the effects of a mineral deficiency, unless it is very severe, are apt to develop only slowly, and may, therefore, escape notice until serious trouble is imminent.

If the shortage is only of brief duration no harm is done, since the animal has a limited power of storing up reserves

NOTES ON FEEDING

of minerals during periods of excess supply, upon which it can draw when the need arises. This applies particularly to the storage of calcium and phosphorus in the skeleton, which is the great reservoir from which the needs of the body for these two elements are supplied. The extent to which the reserves in the bones can be depleted without injury to the bone is limited, however, and a continuous withdrawal must inevitably lead to bone trouble. In the young, growing animal, where any reserve must be small or non-existent, the bones fail to harden properly, and the characteristic lameness or deformation described as "rickets" soon ensues. In adult animals, the bones acquire a brittle character and easily break (osteoporosis). The trouble may be caused by deficiency of either calcium or phosphorus, although the precise effects may differ in points of detail. The problem is not entirely one of the amounts of calcium and phosphorus supplied in the food, since other factors, notably the presence of vitamin D, are essential to ensure proper assimilation and deposition of the minerals.

The familiar need of animals for a supply of salt gives another example of the importance of mineral supply. This mineral, which is a combination of the elements sodium and chlorine, supplies the essential hydrochloric acid and soda for the digestive juices; it promotes the digestion of fats and proteins, facilitates the circulation of nutrients through the cells of the body tissues, and generally improves the palatability of foods. A less familiar function of the sodium of the salt is that of counteracting the otherwise detrimental effects of any excess of potassium. So important and varied are the functions of salt that a small addition to the ration can rarely be out of place with any class of animal, and is probably actually needed more often than that of any other mineral. In practice salt requirement probably reaches its highest point with the milk-producing animal, since milk contains appreciable quantities of sodium and chlorine.

Other examples of the fundamental importance of specific mineral elements are the need for iron for the production and effective action of the red-blood corpuscles, and that for iodine for the proper working of the thyroid and other important glands.

The practical adjustment of the mineral supplies in the food to the actual needs of the animal can only be made very roughly, (1) because of our very imperfect knowledge as to

NOTES ON FEEDING

the precise requirements of the animal, and (2) because of the great variability in mineral content of every foodstuff according to the conditions under which it is produced. The latter difficulty is least with the concentrated foods derived from grains and seeds, and greatest with roots, greenstuffs and fodders. As a rule we have no alternative but to use average figures, and therefore, must be content with a rough estimate of the mineral supplies.

Such average figures for the lime, phosphoric acid, potash and chlorine in a number of commonly-used foods are available in the table on p. 62 of Bulletin 48 (Rations for Live Stock) issued by the Ministry, 1s. 2d. post free.

A survey of these figures leads to certain broad conclusions as to the amount and general nature of the mineral supplies in different classes of feeding stuffs. Before dealing with these, however, certain other considerations relating to the "balance" between the individual mineral elements need to be discussed.

First, we must take into account that certain of the elements (the metals) are basic in character, whilst others are acid. There is much evidence from experimental work in support of the view that any considerable excess of bases over acids or of acids over bases in the ration is undesirable. In this connexion it is perhaps significant that in the minerals of milk, Nature's food for the young animal, the chemical balance between basic and acidic elements is almost exact.

Secondly, apart from the general relation between total bases and total acids there are inter-relations between certain specific elements that should be taken into account. The most important of these are the ratio of calcium to phosphorus and the ratio of potassium to sodium. Mention has already been made of the separate effects of deficiency of calcium or deficiency of phosphorus in causing rickets or osteoporosis. It must be realized, however, that the two are interdependent, and that the ratio between them may be as important as the actual amounts of each present. A ration may supply liberal amounts of calcium and phosphorus and yet give rise to bone trouble owing to one being too greatly in excess of the other.

The practical importance of the ratio of potassium to sodium lies in the fact that an excess of potassium tends to displace sodium from the body and thus increases the rate of loss of the latter in the urine. A supply of sodium (salt) that would be adequate in the presence of a suitable supply of potassium

NOTES ON FEEDING

may thus become inadequate if the latter is in excess, and in these circumstances the supply of sodium in the body is depleted.

A further complication that arises in attempting to arrive at a correct representation of the balance of the various elements lies in the fact that the weights (or percentages) of the various elements are not true measures of their chemical reactive powers—and it is the latter that determine their effects in the body. Thus, 23 parts by weight of sodium are equivalent chemically to 39 parts of potassium; therefore, in a ration containing 0·23 per cent. each of sodium and potassium the apparent exact balance (ratio 1 : 1) is misleading, since the true *chemical* balance is :—

$$\frac{0 \cdot 23}{23} : \frac{0 \cdot 23}{39} \text{ or } \begin{matrix} \text{Sodium} & \text{Potassium} \\ 1 & 0 \cdot 6 \end{matrix}$$

In other words, the ration has not a perfect balance of sodium to potassium (assuming equality to be perfection), but actually contains a relative excess of sodium over potassium. The conception of chemical "equivalent weights" cannot be explained here, and it must suffice to point out that, in examining the various "balances" of the minerals in a ration, the percentage figures for the various minerals must be corrected in proportion to the respective "equivalents" as in the above example.

Lastly, we are faced with the difficulty of knowing what is the correct "balance" (or ratio) to aim at. On this point it is impossible as yet to get precise guidance, and perhaps the best temporary expedient to adopt is to take the mineral matter of milk as our standard, this giving us the following ratios (of "equivalent weights") to aim at:—

Acid Equivalents	:	Base Equivalents	..	1·1 : 1
Phosphoric Acid (P_2O_5)	:	Lime (CaO)	..	1·5 : 1
Soda (Na_2O)	:	Potash (K_2O)	..	0·7 : 1

With these standards we may now compare the following ratios found in average samples of a few common feeding stuffs:—

		<i>Acid Equivalents</i>	<i>Phosphoric Acid</i>	<i>Soda</i>
		<i>: Base Equivalents</i>	<i>: Lime</i>	<i>: Potash</i>
Wheat	1·4 : 1	..
Rye	1·2	..
Barley	1·6	..
Oats	1·9	..
Wheat Straw	1·4	..
Barley	"	..	1·3	..
Oat	"	..	1·1	..
			8·6 : 1	0·5 : 1
			8·7	0·3
			7·1	0·2
			6·2	0·2
			0·4	0·4
			0·8	0·3
			0·7	0·4

NOTES ON FEEDING

		<i>Acid Equivalents</i>	<i>Phosphoric Acid</i>	<i>Soda</i>
		<i>:Base Equivalents</i>	<i>:Lime</i>	<i>:Potash</i>
Meadow Hay ..	..	.. 0·9	.. 0·8	.. 0·2
Young Grass ..	..	.. 0·8	.. 0·6	.. 0·2
Mangolds ..	..	.. 0·5	.. 2·3	.. 0·8
Swedes ..	..	.. 0·7	.. 1·4	.. 0·4
Potatoes ..	..	.. 0·6	.. 5·8	.. 0·2
Sugar-Beet Tops ..	..	.. 0·9	.. 0·6	.. 1·0
Linseed Cake ..	..	.. 0·6	.. 2·1	.. 0·8
Cottonseed Cake ..	..	.. 1·0	.. 9·9	.. 0·2
Soya Meal ..	..	.. 0·8	.. 3·5	.. 0·1
Palm Kernel Meal ..	..	.. 0·9	.. 4·8	.. 0·4

It will be noted that, judged by the milk standards, the cereal grains all show a distinct excess of acid over base, a very large excess of phosphoric acid over lime, and a marked deficiency of sodium as compared with potassium. Clearly, therefore, they need to be supplemented by lime and salt.

The cereal straws show an excess of total acids, but deficiencies of phosphorus and sodium.

Hay and grass are fairly well balanced as to total bases and acids, with a slight preponderance of base, especially calcium; but are relatively low in sodium. In other words, salt will usually be the only supplement required.

Roots show a surplus of total bases, but a deficiency of calcium relative to phosphorus, and, except in mangolds, a marked deficiency of sodium relative to potassium. Potatoes have a large relative excess of phosphorus, but too little sodium.

Oil-cakes are somewhat variable as between different kinds, but on the whole are fairly well balanced as to total acids and bases, with a slight preponderance of base. They all show a large relative excess of phosphorus, and, in most instances, a marked deficiency of sodium.

Viewing these groups of foodstuffs as a whole, the main general features are an excess of phosphorus relative to calcium, and a deficiency of salt, which, interpreted in terms of practice, means that the mineral supplements most commonly needed will be lime and salt.

As to what amount of mineral supplement should be added, we are unfortunately unable to give accurate guidance, except perhaps in a few instances. With high-yielding milch cows that are receiving a fairly large allowance of roots along with hay and concentrated foods, an addition of 2 to 2½ oz. of finely-ground calcium carbonate per head daily will roughly establish a balance of bases to acids and, at the

NOTES ON FEEDING

same time, a suitable ratio of calcium to phosphorus. Along with this an addition of 1 to $1\frac{3}{4}$ oz. of common salt will give a suitable sodium-potassium ratio. Even with these additions, the needs of the cow may not be entirely covered during the period of highest milk-yield, but, if the mineral supplement is continued, especially into the dry period, any losses of minerals from the body incurred during the high-yielding period will be fully restored before the next calving.

For growing cattle, especially if they are not receiving a fair amount of good hay, a suitable mineral supplement will be 1 to $1\frac{3}{4}$ oz. of calcium carbonate, and $\frac{1}{2}$ to 1 oz. of salt per head daily, according to live-weight.

For pigs on meals and water, $\frac{1}{2}$ -oz. per head daily according to size, of a mixture of 3 parts calcium carbonate and 1 part salt will be suitable. If they are receiving fairly large amounts of separated milk or whey, no supply of salt should be necessary, but about one-half of the above allowance of calcium carbonate may be given. This should be raised to the full amount if the meal used includes a large proportion of maize, since this is the poorest of all cereals in lime, whilst relatively rich in phosphorus, and thus very badly balanced.

FARM VALUES OF FEEDING STUFFS

The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

		Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported) .. .	..	71	6·2	7 4
Maize .. .	..	78	7·6	5 10
Decorticated ground-nut cake .. .	..	73	41·3	8 1
" cotton-seed cake .. .	..	68	34·7	8 5
(Add 10s. per ton, in each instance, for carriage.)				

The cost per unit starch equivalent works out at 1·71 shillings, and per unit protein equivalent 1·38 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the November, 1936, issue of the Ministry's JOURNAL, p. 816).

FARM VALUES.

Crop		Starch equivalent	Protein equivalent	Food value per ton, on farm £ s.
		Per cent.	Per cent.	
Wheat .. .	..	72	9·6	6 16
Oats .. .	..	60	7·6	5 13
Barley .. .	..	71	6·2	6 10
Potatoes .. .	..	18	0·8	1 12
Swedes .. .	..	7	0·7	0 13
Mangolds .. .	..	7	0·4	0 13
Beans .. .	..	66	19·7	7 0
Good meadow hay .. .	..	37	4·6	3 10
Good oat straw .. .	..	20	0·9	1 15
Good clover hay .. .	..	38	7·0	3 15
Vetch and oat silage .. .	..	13	1·6	1 4
Barley straw .. .	..	23	0·7	2 0
Wheat straw .. .	..	13	0·1	1 2
Bean straw .. .	..	23	1·7	2 2

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d., post free 7d.

PRICES OF FEEDING STUFFS

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
Wheat, British.. .	£ 8 13	£ 0 8	£ 8 5	72	2 3	1·20	9·6
Barley, British feeding	7 0	0 8	6 12	71	1 10	0·98	6·2
" Danubian ..	7 2	0 8	6 14	71	1 11	1·03	6·2
" Persian ..	7 7	0 8	6 19	71	1 11	1·03	6·2
Oats, English, white ..	7 7	0 9	6 18	60	2 4	1·25	7·6
" black & grey	7 3	0 9	6 14	60	2 3	1·20	7·6
" Scotch, white ..	8 3	0 9	7 14	60	2 7	1·38	7·6
" Canadian, No. 2							
Western	8 17*	0 9	8 8	60	2 10	1·52	7·6
" Canadian, mixed feed	6 15	0 9	6 6	60	2 1	1·12	7·6
Maize, Argentine ..	5 10	0 7	5 3	78	1 4	0·71	7·6
" Danubian Gal. Fox	6 0†	0 7	5 13	78	1 5	0·76	7·6
" South African							
No. 2 white flat	6 18†	0 7	6 11	78	1 8	0·89	7·6
Beans, English, Winter	6 58	0 16	5 9	66	1 8	0·89	19·7
Peas, English, blue ..	11 58	0 14	10 11	69	3 1	1·65	18·1
" Japanese ..	19 15†	0 14	19 1	69	5 6	2·95	18·1
Dari	7 17†	0 8	7 9	74	2 0	1·07	7·2
Milling Offals :—							
Bran, British ..	6 17	0 15	6 2	43	2 10	1·52	9·9
" broad ..	7 7	0 15	6 12	43	3 1	1·65	10
Middlings, fine,							
imported	7 2	0 12	6 10	69	1 11	1·03	12·1
Weatings† ..	7 5	0 14	6 11	56	2 4	1·25	10·7
" Superfine‡	7 12	0 12	7 0	69	2 0	1·07	12·1
Pollards, imported ..	6 15	0 14	6 1	50	2 5	1·29	11
Meal, barley	8 10	0 8	8 2	71	2 4	1·25	6·2
" " grade II ..	7 15	0 8	7 7	71	2 1	1·12	6·2
" maize	6 2	0 7	5 15	78	1 6	0·80	7·6
" " germ	6 10	0 11	5 19	84	1 5	0·76	10·3
" locust bean	7 15	0 5	7 10	71	2 1	1·12	3·6
" bean	8 5	0 16	7 9	66	2 3	1·20	19·7
" fish	14 10	2 1	12 9	59	4 3	2·28	53
Maize, cooked, flaked ..	6 15	0 7	6 8	84	1 6	0·80	9·2
" gluten feed ..	6 10	0 12	5 18	76	1 7	0·85	19·2
Linseed cake :—							
English, 12% oil ..	9 10	1 0	8 10	74	2 4	1·25	24·6
" 9%	9 0	1 0	8 0	74	2 2	1·16	24·6
" 8%	8 15	1 0	7 15	74	2 1	1·12	24·6
Cottonseed cake,							
English, Egyptian							
seed, 4½% oil ..	5 7	0 17	4 10	42	2 2	1·16	17·3
Cottonseed cake,							
Egyptian, 4½% oil ..	5 2	0 17	4 5	42	2 0	1·07	17·3
Cottonseed cake,							
decorticated, 7% oil	8 5†	1 7	6 18	68	2 0	1·07	34·7
Cottonseed meal,							
decorticated, 7% oil	8 2†	1 7	6 15	70	1 11	1·03	36·8

PRICES OF FEEDING STUFFS (continued)

Description	Price per ton	Manuri- al value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro-tein equiv.
Coconut cake, 6% oil	£ 6 15	£ 0 17	£ 5 18	77	s. d. 1 6	d. 0·80	16·4
Ground nut cake, decorticated, 6-7% oil	8 2†	1 7	6 15	73	1 10	0·98	41·3
Ground nut cake, imported decorti- cated, 6-7% oil ..	8 0	1 7	6 13	73	1 10	0·98	41·3
Palm-kernel cake, 4½-5½% oil ..	6 15†	0 12	6 3	73	1 8	0·89	16·9
Palm-kernel cake meal, 4½% oil	6 12†	0 12	6 0	73	1 8	0·89	16·9
Palm-kernel meal, 1-2% oil	6 2	0 12	5 10	71	1 7	0·85	16·5
Feeding treacle ..	5 0	0 8	4 12	51	1 10	0·98	2·7
Brewers' grains, dried ale	5 17	0 11	5 6	48	2	1·16	12·5
Brewers' grains, dried porter	5 10	0 11	4 19	48	2 1	1·12	12·5

(a) Carriage paid in 5-ton lots. * At Bristol. § At Hull. † At Liverpool. ‡ In these instances manurial value, starch equivalent and protein equivalent are provisional.

NOTE: The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of November, 1936, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then since its manurial value is £1 per ton as shown above, the cost of food value per ton is £9. Dividing this figure by 74, the starch equivalent of linseed cake as given in the Table, the cost per unit of starch equivalent is 2s. 5d. Dividing this again by 22·4, the number of pounds of starch equivalent in one unit, the cost per lb. of starch equivalent is 1·29d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the Table under the heading manurial value per ton are calculated on the basis of the following unit prices: N., 7s.; P₂O₅, 2s. 3d.; K₂O, 3s. 6d.

MISCELLANEOUS NOTES

Investigation into the Feeding Value of Herring Meal

THE feeding of herring meal to live stock, particularly to bacon and pork pigs, dairy cows and poultry, has always been discouraged in view of the risk of producing a fishy taint in the flesh of pigs and in other products, such as eggs or milk intended for human consumption. Experiments in this and other countries, however, have shown that, apart from the disadvantage of taint, herring meal is a valuable feeding stuff, being rich in proteins and vitamins and well balanced with minerals.

The Herring Industry Board, which had given some consideration to the problem as a possible means of increasing the consumption of herring meal and affording some measure of relief to the herring industry, approached the Ministry with regard to the possibility of instituting, at the expense of the Board, research into the feeding value of herring meal. A meeting held at the Ministry, attended by representatives of the Herring Industry Board and of the various stock-feeding centres interested in the subject, considered the present state of knowledge regarding herring meal and the possibility, practicability, and usefulness, of initiating research work in connexion with this feeding stuff. It was generally agreed that any work undertaken should fall into two categories: (1) fundamental research into the cause of taint and its possible removal, and (2) straightforward feeding trials, critical and non-critical, with various classes of stock, but excluding pork and bacon pigs.

A programme of investigations prepared on these lines has now been approved by the Herring Industry Board. Fundamental research into taint will be carried out at the National Institute for Research in Dairying at Reading, where the provision made by the Board will include the salary of a bio-chemist who has been appointed to undertake the chemical investigations. Feeding trials with store cattle, dairy heifers, calves, breeding ewes, breeding sows and poultry will be carried out at the Rowett Institute, Aberdeen, and certain centres in England and Wales.

The Agricultural Index Number

THE November index of the prices of agricultural produce at 125 (base 1911-13=100) is the same as for October, and 12 points above that of a year ago. (If allowance be made

MISCELLANEOUS NOTES

for payments under the Wheat Act, 1932, and the Cattle Industry (Emergency Provisions) Act, 1934, the revised index number is 129.) Advances in prices were recorded for wheat, fat sheep and pigs, poultry, butter, cheese, potatoes and wool, while barley and fat cattle were lower than in October.

Monthly index numbers of prices of Agricultural Produce. (Corresponding months of 1911-13 = 100.)

Month	1931	1932	1933	1934	1935	1936
January ..	130	122	107	114	117	119
February ..	126	117	106	112	115	118
March ..	123	113	102	108	112	116
April ..	123	117	105	111	119	123
May ..	122	115	102	112	111	115
June ..	123	111	100	110	111	116
July ..	121	106	101	114	114	117
August ..	121	105	105	119	113	119
September ..	120	104	107	119	121	127
October ..	113	100	107	115	113	125
November ..	112	101	109	114	113	125
December ..	117	103	110	113	114	—

Revised monthly index numbers of prices of Agricultural Produce, allowing for payments under the Wheat Act (a) and the Cattle Industry (Emergency Provisions) Act (b).

Month	1932	1933	1934	1935	1936
January ..	—	111	119	124	125
February ..	—	110	117	122	123
March ..	—	106	112	119	122
April ..	—	109	116	126	129
May ..	—	105	116	117	120
June ..	—	104	114	117	121
July ..	—	104	117	120	121
August ..	108	108	122	120	124
September ..	108	111	125	128	133
October ..	104	112	121	120	129
November ..	105	113	120	119	129
December ..	107	114	120	120	—

(a) Commenced August, 1932. (b) Commenced September, 1934.

Grain. Wheat at an average of 8s. 7d. per cwt. was 2d. higher than in October, and the index rises by 1 point to 114. (If the " deficiency payment " under the Wheat Act, 1932, is taken into consideration the figure becomes 130.) Barley was lower both in price and index, the former moving downwards from 10s. 1d. to 9s. 9d. per cwt. and the latter from

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119 to 115. Quotations for oats remained unchanged at 6s. 10d. per cwt., but in consequence of a slight rise which took place during the base period, the index at 98 shows a fall of 1 point. A year ago wheat averaged 5s. 10d. per cwt., barley 8s. 7d. and oats 6s. 1d., the indices being 78, 101 and 87 respectively.

Live Stock. Prices of fat cattle showed a slight decline; the average for second quality at 31s. 3d. per live cwt. compared with 31s. 8d. the previous month and the index declines by 2 points to 93. The addition of the subsidy under the Cattle Industry (Emergency Provisions) Act, 1934, raises the index to 108. At 9½d. per lb. for second quality, fat sheep rose by ½d. per lb.; owing, however, to a proportionately greater increase in price which occurred during the corresponding months of 1911-13, the index falls from 131 to 130. Quotations for baconers and porkers also were higher, the former by 2d. to 11s. 10d. per score and the latter by 10d. to 13s. 9d., the relative indices moving upwards from 114 to 118 and 119 to 126.

Both dairy cows and store cattle were slightly dearer than in October; the index for the former rises by 2 points to 109, but that for store cattle remains at 95. Store sheep were somewhat cheaper and this, in conjunction with a reverse movement in the base prices, results in a reduction in the index from 132 to 117. The index for store pigs shows a rise of 5 points to 155.

Dairy and Poultry Produce. The regional contract price of milk continued at last month's level and the index of 171 is repeated. Butter rose by ½d. to 1s. 2d. per lb. as against an increase of ½d. per lb. between October and November of 1911-13, and in consequence the index falls from 98 to 97. At 19s. 7d. per 120, quotations for eggs were the same as a month ago; here, again, on account of the considerable rise in the base prices, the latest index moves downwards by 30 points to 111. Cheese averaged £4 os. 6d. per cwt. as against £3 15s. in October, and the index at 107 is higher by 6 points. Most descriptions of poultry also made more money, the combined index advancing from 115 to 116.

Other Commodities. At £7 8s. 6d. per ton, potatoes showed an increase in price of 3s. and the index at 209 compares with 202 recorded for the previous month. Quotations for hay were little altered and the combined index continues

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unchanged at 102. At 1s. $1\frac{1}{2}$ d. per lb. wool rose by $\frac{1}{2}$ d., the index of 107 being higher by 5 points.

Monthly index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity	1934	1935	1936			
	Nov.	Nov.	Aug.	Sept.	Oct.	Nov.
Wheat	66	78	96	98	113	114
Barley	104	101	100	124	119	115
Oats	94	87	98	98	99	98
Fat cattle	96	92	102	98	95	93
,, sheep	123	120	128	131	131	130
Bacon pigs	103	93	111	111	114	118
Pork	118	103	107	109	119	126
Eggs	111	109	130	124	141	111
Poultry	114	118	113	113	115	116
Milk	161	171	175	202	171	171
Butter	83	97	100	98	98	97
Cheese	93	87	113	106	101	107
Potatoes	146	160	109	149	202	209
Hay	104	84	98	105	102	102
Wool	85	91	95	100	102	107
Dairy cows	105	103	103	103	107	109
Store cattle	83	90	101	97	95	95
,, sheep	107	112	126	132	132	117
,, pigs	147	129	133	138	150	155

Revised index numbers due to payments under the Wheat Act and the Cattle Industry (Emergency Provisions) Act.

Wheat	116	121*	122	130	131	130
Fat cattle	110	106	117	113	109	108
General Index	120	119	124	133	129	129

* Superseding figure previously published.

Wart Disease Immunity Trials, 1937

THE Ministry will continue during the coming season to test, at the Potato Testing Station of the National Institute of Agricultural Botany at Ormskirk, potatoes and potato seedlings as to their immunity from or susceptibility to Wart Disease on the conditions stated below.

The entry form (No. 345 H.D.), obtainable from the Ministry, should be filled up and returned to the Potato Testing Station, Ormskirk, Lancs, with the requisite fees. Samples must be sent to that Station as early as possible, but in any case not later than March 6.

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Potatoes are accepted from *English, Scottish and Irish growers* for trial under the following conditions:—

(a) Quantity of each stock of potato to be sent for the first time—50 seed size tubers.

Quantity of each stock of potato to be sent for the second and for subsequent years—35 seed size tubers.

(b) Fees on the following scale are payable in respect of each stock of potato when first entered for immunity trials:—

Less than 5 samples from one grower, 10s. per sample.

5 samples or more from one grower 8s. per sample up to 20, and 6s. for each sample in excess of 20.

These fees are not returnable under any circumstances.

(c) The Ministry, while taking reasonable precautions to secure satisfactory growth, can accept no responsibility for the failure of any variety.

(d) The Ministry will take all reasonable precautions to secure that all the produce of the trial plots is fed to stock after being thoroughly mixed together, except such portions as may be needed for exhibition or scientific purposes authorized by the Ministry. The Ministry, however, reserves the right to send tubers from the produce grown at Ormskirk for testing at the official stations of the Department of Agriculture for Scotland and the Ministry of Agriculture for Northern Ireland.

(e) All stocks entered for the trials will be tested both in the laboratory and in the field. When the Ministry is satisfied as a result of the trials that a variety is immune from Wart Disease, it will formally "approve" the variety and will issue an official certificate of immunity. Such certificates will not be issued until the variety has been named and until an assurance has been received from the sender that it has been, or is about to be, introduced into commerce. *When a variety tested under a number or letter has been subsequently named and "approved," a sample of 100 tubers of the variety as named must be sent to Ormskirk for comparison with the tested stock.* No certificate will be issued for any new variety until it has passed at least two consecutive years' tests without contracting the disease and has been declared by the Synonym Committee of the National Institute of Agricultural Botany to be distinct from existing varieties.

Potatoes are accepted from *foreign growers* on the conditions (a) to (d) set out above, but no foreign variety will be formally "approved" and no certificate will be issued until the variety is definitely introduced into commerce in Great Britain.

Trials of Seedlings. The Ministry desires to encourage the breeding of new varieties of potatoes, and in order to provide information for breeders of seedlings it is prepared to accept not fewer than two tubers, and not more than ten tubers, of any seedlings for testing in the laboratory and growing for one season on the trial plots, and to furnish a report on the results obtained, without payment of a fee. These tests, however, will not be considered as forming part of the Immunity Trials proper, and will not be reckoned in the minimum

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period of two years referred to under (e). The results of these tests will not be included in any report issued by the Ministry.

GENERAL INSTRUCTIONS: *Carriage.*—Small consignments should be sent by passenger train, carriage paid, or by parcel post; larger consignments should be forwarded by goods train, carriage paid.

Labels.—All consignments should be distinctly labelled. A label bearing the name and address of the sender and name of variety or seedling number should be firmly tied to the bag; in addition a similar label should be placed inside the bag.

Address.—All consignments should be addressed to:—

THE SUPERINTENDENT,
POTATO TESTING STATION,
NATIONAL INSTITUTE OF AGRICULTURAL BOTANY,
ORMSKIRK, LANCS.

Station : Ormskirk, L.M. & S. Railway.

Date of Forwarding.—Consignments should be sent so as to reach the Testing Station as early as possible, and in any case not later than March 6.

Advisory Leaflets

SINCE the date of the list published in the August, 1936, issue of this JOURNAL (p. 421), the undermentioned Advisory Leaflets have been issued by the Ministry:—

- No. 67.—The Cultivation of Lucerne (Revised).
- No. 78.—Gapes in Poultry (Revised).
- No. 100.—Apple Canker (Revised).
- No. 195.—The Diamond-Back Moth (Revised).
- No. 272.—Fowl Paralysis.
- No. 273.—American Gooseberry Mildew.
- No. 274.—Wart Disease of Potatoes.
- No. 275.—Stomach Worms in Sheep.
- No. 276.—Club Root.
- No. 278.—Potato Leaf-Roll.

Copies of any of the above-mentioned leaflets may be purchased from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, or at the Sale Offices of that Department at Edinburgh, Manchester, Cardiff and Belfast, price 1d. each net (1½d. post free), or 9d. net per doz. (10d. post free).

Single copies of not more than 20 leaflets may, however, be obtained, free of charge, on application to the Ministry. Further copies beyond this limit must be purchased from H.M. Stationery Office, as above.

A list of the Ministry's publications, including leaflets, on agriculture and horticulture may be obtained free and post free on application to the Ministry.

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Agricultural Economics Society's Essay Competition

THE result of the Agricultural Economics Society's Essay Competition for 1935-36, of which particulars were given in the issue of this JOURNAL for August, 1935 (p. 424), has been announced. The First Prize of £10 has been withheld. The Second Prize of £5 has been awarded to Mr. W. F. Searle, B.Sc. (Econ.), of 10, Fladgate Road, Leytonstone, London, E.11, for his essay on "Trends of Production in British Agriculture."

Supplies of Canned and Dried Fruit, 1935*

THIS valuable annual summary of the supply statistics relating to canned and dried fruits, fruit pulp and canned vegetables, round off, in a handy form for reference, the weekly supplement and the monthly "Canned and Dried Fruit Notes" issued by the Imperial Economic Committee, which for a number of years have proved to be of real value to those interested in the United Kingdom's trade in canned and other types of processed fruits and vegetables. It contains a great deal of concise information, derived from various sources, which is not supplied by Board of Trade Returns. Tables are included showing the source of supply of imports, the quantities of the various products imported, the ports of arrival and of ultimate destination of the imports. These Tables are also an approximate guide as to local preferences for particular products.

Imports of canned and bottled fruits in 1935 created a record, being 184,600 tons of a declared value of £6,058,000, and the total quantity thus available for consumption per head of the population was 88 lb. or nearly 3 lb. greater than in 1930. Home production of canned and bottled fruits has increased at a greater rate during these five years, but is still relatively small, and represents only a consumption of about 1 lb. per head of the population over and above the consumption of imported goods. In recent years, Empire imports, consisting for the most part of fruits not produced in this country, have increased at the expense of canned products of foreign origin, but in 1935 they were somewhat lighter than in 1934.

* *Supplies of Canned and Dried Fruit, 1935.* Printed and published for the Imperial Economic Committee by H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 2s. 6d., post free 2s. 9d.

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the proportion declining from 43·8 to 38·6 per cent. of the total.

The imports of canned vegetables in 1935 are estimated at 1,245,000 cwt. as against 970,000 cwt. in 1934. The home production in 1934 was 1,022,000 cwt., but information as to the production in 1935 was not available. The bulk of imported vegetables consists of kinds, such as tomatoes, that are not produced on a competitive commercial scale in this country.

Agricultural Workers' Act, 1936, New Zealand

THE Agricultural Workers' Act, 1936, which came into force in New Zealand on October 1, 1936, supersedes and extends former enactments governing the provision of accommodation for agricultural workers, and as regards workers employed on dairy farms, provides for minimum wages at prescribed rates with an additional sum in cases where the employer does not provide board and lodging. After July 31, 1937, the minimum rates may, by Order in Council, be increased from time to time in the light of prices fixed for dairy produce under the Primary Products Marketing Act, 1936; when no such Order is in force the prescribed rates must be observed. Provision is also made for minimum holidays with full pay, together with one-half of the prescribed allowance for board and lodging. If a worker can establish that he is incapable by reason of infirmity, arising from old age or other cause, of earning the minimum rate of wage, he may be granted from time to time a permit to accept wages at such lower rate as may be specified in the permit. Although the minimum wage and holiday provisions at present apply only to workers on dairy farms, they may from time to time, by Order in Council, be extended with necessary modifications to other classes of agricultural workers; before any such Order is made, however, organizations representing employers and workers must be consulted. Other provisions relate to the prohibition of the employment of children under the age of 15 on dairy farms and the keeping of wages and holiday records by employers. The Department of Labour is responsible for the administration of the Act, and local supervision is undertaken by inspectors whose powers and duties are defined.

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Farm Workers' Minimum Rates of Wages.—A meeting of the Agricultural Wages Board was held at King's Buildings, Smith Square, London, S.W.1, on Tuesday, December 15, 1936, the Rt. Hon. the Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages, and proceeded to make the following Orders:—

Berkshire.—An Order fixing minimum and overtime rates of wages to come into force on December 27, 1936 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until January 1, 1938. The minimum rates for male workers of 21 years of age and over are 32s. (instead of 31s. as at present) per week of 50 hours, except in the weeks in which Good Friday, Coronation Day, Whit Monday and Christmas Day fall when the hours are 41, with overtime at 9½d. per hour (instead of 9d. per hour as at present). The minimum rate for female workers of 19 years of age and over is unchanged at 5d. per hour for all time worked.

Buckinghamshire.—An Order cancelling the existing minimum and overtime rates of wages and fixing fresh rates in substitution therefor to come into force on December 20, 1936, and to continue in operation until January 1, 1938. The minimum rates for male workers of 21 years of age and over are 33s. (instead of 32s. as at present) per week of 50 hours in summer, except in the weeks in which Easter Monday, Coronation Day and Whit Monday fall when the hours are 41, and 48 hours in winter, except in the week in which Christmas Day and Boxing Day fall when the hours are 31. The overtime rates are 10d. per hour on weekdays (instead of 9d. per hour as at present) and 11s. per hour on Sundays, Easter Monday, Coronation Day, Whit Monday, Christmas Day and Boxing Day (instead of 11d. per hour on Sundays, Easter Monday, Whit Monday, Christmas Day and Boxing Day as at present). The minimum rates for female workers of 18 years of age and over are 7d. per hour (instead of 6½d. per hour as at present) with overtime at 8½d. per hour on weekdays (instead of 7½d. as at present) and 10d. per hour on Sundays, Easter Monday, Whit Monday, Coronation Day, Christmas Day and Boxing Day (instead of 9d. per hour on Sundays, Easter Monday, Whit Monday, Christmas Day and Boxing Day as at present).

Derbyshire.—(1) An Order fixing minimum and overtime rates of wages to come into force on December 26, 1936 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until December 25, 1937. The minimum rate for male workers of 21 years of age and over is 8d. per hour. For whole-time workers provision is made for payment at not less than 36s. per week of 54 hours, except in the weeks in which Good Friday, Easter Monday, Christmas Day and Boxing Day fall when the hours are 45. The overtime rates for adult male workers are 10d. per hour on Sundays and 9d. per hour for employment on Good Friday, Easter Monday, Christmas Day and Boxing Day (instead of 10d. per hour for all overtime employment, i.e., on Sundays, as at present). The rates for female workers of 18 years of age and over are unchanged at 5d. per hour with payment for overtime (i.e., employment on Sundays) at 8d. per hour.

(2) An Order fixing special differential rates of wages for male workers of 18 years of age and over for overtime employment on the hay and corn harvests of 1937. The rate for male workers of 21 years of age and over is 9d. per hour.

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Hampshire and Isle of Wight.—An Order fixing minimum and overtime rates of wages to come into force on December 27, 1936 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until January 1, 1938. The minimum rates for male workers of 21 years of age and over are 31s. (as at present) per week of 51 hours in summer, except in the weeks in which Good Friday, Easter Monday, Coronation Day, Whit Monday and August Bank Holiday fall when the hours are 41½, and 48 hours in winter, except in the weeks in which Christmas Day and Boxing Day fall when the hours are 40. The overtime rates are unchanged at 9d. per hour throughout the year, except in the case of carters, cowmen, shepherds and milkers for work in connexion with the immediate care of animals in which case the overtime rate is 8d. per hour. The minimum rate for female workers of 18 years of age and over remains unchanged at 5d. per hour for all time worked.

Norfolk.—An Order fixing minimum and overtime rates of wages to come into force on December 27, 1936 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until December 25, 1937. The minimum rates are for workers of 21 years of age and over 33s. 6d. (instead of 31s. 6d. as at present) per week of 50 hours in summer, except in the week in which Good Friday falls when the hours are 42, and 48 hours in winter, except in the week in which Christmas Day falls when the hours are 40, with in addition in the case of workers employed as teamsmen, cowmen, shepherds or yardmen, 5s. 6d. per week, and in the case of sheep tenders and bullock tenders 4s. 6d. per week in lieu of overtime in respect of work in connection with animals other than such work on Good Friday and Christmas Day in respect of which an additional sum of 5s. is payable except where a day's holiday on full pay is given in the weeks in which those holidays fall or in the weeks immediately following. The overtime rates for all male workers of 21 years of age and over are unchanged at 9d. per hour on weekdays and 11d. per hour on Sundays. The minimum rates for female workers of 18 years of age and over are 5d. per hour with overtime at 6½d. per hour on weekdays and 7½d. per hour on Sundays (as at present).

Nottinghamshire.—An Order varying the existing minimum and overtime rates of wages, the rates as varied to come into force on December 20, 1936. The minimum rates for male workers of 21 years of age and over are 32s. (as at present) per week of 50 hours, except in the weeks in which Christmas Day and Good Friday fall when the hours are 41 (instead of 50 hours throughout the year as at present) with overtime at 9½d. per hour on weekdays and 11½d. per hour on Sundays, Christmas Day and Good Friday. Provision is made for an adjustment of the hours in respect of which the minimum weekly wage is payable in the weeks in which Easter Monday and Boxing Day fall to meet cases where holidays are given in those weeks instead of in the weeks in which Good Friday and Christmas Day fall. For female workers of 18 years of age and over the minimum rate remains unchanged at 5d. per hour with overtime at 8d. per hour.

Surrey.—An Order fixing minimum and overtime rates of wages to come into force on December 20, 1936 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until December 18, 1937. The minimum rates for skilled male workers (horsemen, stockmen and shepherds) of 21 years of age and over are

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40s. (instead of 38s. 8d. as at present) per week of 60 hours except in the weeks in which Christmas Day and Good Friday fall when the hours are 51. For other male workers (except casual workers) of 21 years of age and over the minimum rates are 33s. 4d. (instead of 32s. 3d. as at present) per week of 50 hours, except in the weeks in which Christmas Day and Good Friday fall when the hours are 41. In both cases provision is made for the payment of a minimum rate of wages in respect of a reduced number of hours in Easter week (instead of in the week in which Good Friday falls) if a holiday is given on Easter Monday in lieu of one on Good Friday. For casual male workers of 21 years of age and over the minimum rate is unchanged at 7½d. per hour. The overtime rates for all classes of adult male workers are unchanged at 9d. per hour on weekdays and 11d. per hour on Sundays. For female workers of 18 years of age and over the minimum rate remains unchanged at 5½d. per hour with overtime at 7d. per hour on weekdays and 8d. per hour on Sundays.

Wiltshire.—An Order fixing minimum and overtime rates of wages to come into force on December 27, 1936 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until January 1, 1938. The minimum rates for male workers of 21 years of age and over are 31s. (as at present) per week of 50 hours, except in the weeks in which Good Friday, Easter Monday, Coronation Day, Whit Monday and Christmas Day fall when the hours are 41. The overtime rates are 9d. per hour on weekdays (as at present) and 10d. per hour on Sundays, Good Friday, Easter Monday, Coronation Day, Whit Monday and Christmas Day (instead of Sundays, Good Friday and Christmas Day as at present). The rate for overtime employment on the hay and corn harvests on weekdays is 9d. per hour (as in 1936). The minimum rate for female workers of 18 years of age and over is 5d. per hour for all time worked (as at present).

Denbigh and Flint.—(1) An Order fixing minimum and overtime rates of wages for workers (other than male workers wholly or mainly employed in forestry) to come into force on February 16, 1937 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until February 15, 1938. The minimum rate for male workers of 21 years of age and over employed wholly or mainly as team-men, cattlemen, cowmen, shepherds or bailiffs is 36s. 6d. (instead of 35s. 6d. as at present) per week of 60 hours, and for other male workers except casual workers of 21 years of age and over 31s. (instead of 30s. 6d. as at present) per week of 48 hours in winter and 50 hours in summer. The overtime rate for male workers of 21 years of age and over, other than casual workers, remains unchanged at 9d. per hour. The minimum rate for casual male workers of 21 years of age and over is 8d. per hour (as at present) for all time worked, "casual employment" being "employment under a contract of service for a period of less than one week." For female workers of 18 years of age and over the minimum rates remain unchanged at 5d. per hour per week of 48 hours with overtime at 6½d. per hour.

(2) An Order fixing minimum and overtime rates of wages for male workers employed wholly or mainly in forestry, to come into force on February 16, 1937, and to continue in operation until February 15, 1938. The minimum rate for male workers of 21 years of age and over employed wholly or mainly in forestry is 36s. (instead of 35s. as at present) per week of 50 hours with overtime unchanged at 9d. per hour.

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Enforcement of Minimum Rates of Wages.—During the month ending December 12, 1936, legal proceedings were taken against ten employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

Committee Area	Court	Fines Imposed	Costs Allowed	Arrears of Wages ordered	No. of workers involved
Cheshire ..	Sandbach	£ 0 10 0	£ 0 5 0	66 14 10	2
Derby ..	Swadlincote	1 0 0	0 2 6	20 0 0	1
Lancs ..	Blackburn	*	2 15 0	18 0 0	1
" ..	Rochdale	5 0 0	0 2 0	11 13 4	1
Stafford ..	Lichfield ..	10 0 0	—	60 0 0	1
" ..	Eccleshall	2 0 0	0 4 0	17 0 0	2
Yorks (E.R.) ..	Hull ..	10 0 0	0 1 0	16 2 8	1
" (W.R.) ..	Barnsley	10 0 0	3 3 0	27 6 3	1
Glamorgan ..	Bridgend ..	5 0 0	2 4 6	29 6 3	1
Pembroke ..	Haverford-west	1 0 0	—	5 16 2	1
		44 10 0	8 17 0	271 19 6	12

* Dismissed under the Probation of Offenders Act.

Foot-and-Mouth Disease.—No further outbreak occurred in the Idless, Truro, Cornwall, Infected Area and the area was released from restrictions on December 10.

A fresh outbreak at Sealand, Chester, was confirmed on November 27 and restrictions were imposed over an area extending approximately five miles round the infected premises. As the disease position in this locality remained satisfactory, the area was reduced to approximately two miles round the infected premises on December 12 and restrictions were finally removed on December 19.

Thirty-two further outbreaks were confirmed in the Cheshire and Derbyshire Infected Area between November 28 and December 28, making a total of 35 outbreaks in this Area since the initial outbreak was confirmed at Bosley on November 23. In addition, there was a further case of disease on premises at Flagg, Buxton, on which disease had previously been confirmed. In consequence of outbreaks at South Wingfield, Derby, on November 28, at Aston-by-Budworth on November 30, and at Belper, Derby, on December 8, it was necessary to extend the original Infected Area, but on December 15 this Area was reduced to three smaller and separate areas, extending approximately five miles round Aston, five miles round Bosley, and 15 miles round Bakewell. The Bosley and the Aston Areas were finally released from restrictions on December 18 and December 22 respectively. The Bakewell Area has been contracted in successive stages until, on December 28, it comprised an area of approximately five miles round the infected premises at Chelmorton, Monyash, Youlgreave, Barlow, South Wingfield and Belper. A further contraction to five miles round Monyash, Youlgreave and Flagg will come into operation on January 14, 1937, by Order issued on December 30, 1936.

Outbreaks were confirmed at South Leverton, Retford, Notts, on November 29, and at Laneham, Retford, on December 1. Restrictions were imposed over an area having a radius of 15 miles round the Infected

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place at South Leverton on November 29, and, as the disease position remained satisfactory after the Lanham outbreak, this Area was reduced to one of a radius of approximately five miles round the two Infected premises on December 15. The restrictions were finally removed on December 23.

Outbreaks were also confirmed at Newstead Abbey, Nottingham, on December 10, at Newton Regis, Tamworth, Warwick, on December 12, 19 and 27, and at Lichfield on December 14. The usual restrictions were imposed over areas of approximately 15 miles round Newstead Abbey and Newton Regis.

The Newstead area was contracted to an area of approximately five miles radius round the Infected premises on December 25, and will be released from restrictions on January 1, 1937. The Newton Regis area was contracted to one of approximately five miles round the Infected premises at Newton Regis and Lichfield on December 27, and will be further contracted on January five to approximately five miles round Newton Regis.

APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS: ENGLAND

Cheshire: Miss D. M. Phillips, B.Sc., N.D.D., has been appointed Assistant Instructor in Dairying, *vice* Miss E. L. Coleman, N.D.D., B.D.F.D.

Gloucestershire: Mr. B. J. Fricker, N.D.A., N.D.D., B.D.F.D., has been appointed Agricultural Organizer, *vice* Mr. E. Rea, N.D.A., N.D.D., and will take up his duties on February 1, 1937.

Hampshire: Mr. R. A. Johnson has been appointed Manager of Egg-laying Trials, *vice* Mr. N. F. Smith.

Mr. J. A. Wyatt, B.Sc. (Agric.), N.D.A., N.D.D., has been appointed Assistant Dairy Officer, *vice* Mr. J. A. Duncan, B.Sc. (Agric.), N.D.A., N.D.D.

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The Marketing of Australian and New Zealand Primary Products.
By W. Millar Smith, M.A., B.Com. (N.Z.), Ph.D. (Econ.) (Lond.), F.S.S. Pp. xvii + 352. (London: Sir Isaac Pitman & Sons, Ltd. 1936. Price 12s. 6d. net.)

This book covers a very wide field, embracing the history of organized marketing in Australia and New Zealand in both its practical and legal aspects. The methods of marketing wool, wheat, dairy produce and meat are dealt with in considerable detail, while the section on the Australian Constitution and inter-State trade is of particular value at the present time. The work is not only descriptive; it exposes the economic principles that condition the practical measures which have been taken.

Dr. Smith points out that the securing of specially-protected prices for one agricultural commodity after another has tended to depress more and more the prices of non-controlled goods, on which the burden of the artificial economy falls. He suggests that the export control boards generally do not display much interest in promoting adequate reforms in marketing methods, and he argues that much of the work of the export boards, such as freight and insurance contracts and advertising, might be undertaken by a single export trades commission set up in each Dominion on the lines of the Perishable Products Export Control Board set up in South Africa in 1926.

A long chapter is devoted to the problem of maximizing returns to producers, and the future prospects of various lines of marketing policy are considered. The author is convinced that it will be necessary to go forward with the large-scale organization of farming, but he points out

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that this development brings an increasing need for social control. Co-ordinating or directive bodies will fail if they do not take a broad enough view of their duties, particularly as regards the service they offer to consumers ; farm profits can no longer be regarded as the sole criterion of agricultural marketing policy.

This scholarly work, as Professor Coatman suggests in his Foreword, will be of particular value to all who are interested not only in the working of the Ottawa Agreements but in their probable readjustment from time to time ; the book will, of course, also benefit all who are concerned at any stage in the marketing of the primary produce of Australia and New Zealand.

Plantation Crops. Pp. 78. (London : H.M. Stationery Office. 1936. Price 2s. 6d.)

The title of this review recalls the time when sugar, tea, coffee, cocoa, spices, tobacco and rubber were produced principally or entirely by planters, and, although to-day only a few of these commodities are still plantation crops in the old sense, the traditional title has been retained by the Imperial Economic Committee which issues this summary of figures of production and trade relating to these crops. It is gratifying to note that the United Kingdom tends to rely increasingly on Empire sources for its supplies of these products.

Pigs : Hints on Breeding, Feeding and Management. Pp. 57. Illustrated. (London : National Pig Breeders' Association, Victoria House, Southampton Row, W.C.1. 1936. Price 1s.)

A section of this brochure consists of a useful series of articles "for beginners" (and others), contributed by Mr. J. W. Reid, Vice-Principal of the Hertfordshire Institute of Agriculture. The important subject of pedigree is dealt with in a paper by the late Mr. Leopold C. Paget, and there is a chapter on "Common Ailments of Pigs" by Major C. G. Saunders.

Correspondance Economique Roumaine. Quarterly Journal of the Roumanian Ministry of Trade and Industry. Vol. 18, No. 2, April-June, 1936. (Bucarest : The State Printing Office. Price 200 lei.)

This issue of the Quarterly Journal of the Ministry of Trade and Industry of Roumania, published in French and English, contains a full account of the development of the beet-sugar industry in that country, by two officers of the Ministry, M. Georges Ioanitziu and Dr. Calmuschi. The article opens with a brief general history of the sugar industry in the world up to the formation of the international committee last year. An account is then given of the efforts of the Roumanian Government to encourage the growth of the sugar-beet industry following the establishment of two factories in 1875 as a result of a law of 1873 granting duty exemption. For a short period following the War, the sugar factories received no special assistance, but tariff protection was soon restored and Government control has since steadily increased. The industry now works under a law of April 13, 1933, which is reprinted in full. Before the War, four factories were in operation, but, with the addition of the factories acquired with new territories after the War, Roumania now possesses 15 factories. The report includes a brief description of the technical equipment of the factories and the financial resources of the operating companies. The operation of the post-war legislation is explained in detail and full supporting statistics are quoted with regard to such matters as production, consumption, taxes, prices.

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Wool Production and Trade, 1935-1936. A Supplement to "Wool Intelligence Notes" prepared in the Intelligence Branch of the Imperial Economic Committee. Pp. 78. (London: His Majesty's Stationery Office. 1936. Price 2s. 6d.).

The main conclusion that emerges from this informative compilation is that wool-prices during the past season were steadily and considerably above those of the previous season, despite various economic and political disturbances. Prices showed a rising tendency until March-April, after which there was a slight reaction, followed by a recovery in July and August. The statistical position of the commodity at the close of the season in June was very satisfactory. Germany and Italy continued to restrict imports and to encourage domestic production, but the reduced purchases by these countries were balanced by the increased requirements of Japan and the United States. The United Kingdom, the world's largest wool consumer, maintained its interest in all markets. In South America, both Argentina and Uruguay appointed Government Commissions to supervise and assist the sheep-raising industry.

Refrigeration for the Farm and Dairy. By C. A. Cameron Brown, B.Sc., A.M.I.E.E. Pp. 51. (Oxford: Institute for Research in Agricultural Engineering, Parks Road. 1936. Price 1s. 6d.)

This brochure gives an excellent account of the principles of refrigeration and their application to the farm and dairy. Progressive dairymen will find here, clearly set forth, information that will be of material value to them in their business. The information will also be useful to agriculturists who desire to understand the basis of this important process. The compression and absorption systems of refrigeration are treated non-technically and illustrated by simple diagrams. The merits of direct expansion cooling as compared with artificial cooling, are discussed from a practical standpoint, and a note on the steam sterilization of the equipment is included. A cold storage section describes the essentials of the construction and operation of an insulated chamber, including the problem of defrosting. Costs of such equipment and its maintenance are indicated by working examples. There are useful notes on portable cooling devices involving the use of solid carbon dioxide, and careful explanations of the so-called "gas-storage" system of fresh fruit preservation, and the significance of successful cold storage on the development of marketing schemes for such things as lettuce and other perishable market garden produce. The pre-cooling and short period storage of poultry carcasses and the cold storage of eggs, are also dealt with informatively. The brochure is altogether instructive, useful to food producers and distributors alike.

A Survey of the Agricultural and Waste Lands of Wales. Edited for the Cahn Hill Improvement Scheme by R. G. Stapledon, C.B.E. Pp. xv + 143. 8 Figs. and 1 Map. (London: Faber & Faber, Ltd. 1936. Price 15s.)

Most of the readers of this JOURNAL will be acquainted with Professor Stapledon's now famous book "The Land, Now and To-morrow," and with the ideas he expounded in it. The present volume is a detailed study of the grass lands of Wales, and provides evidence of a decisive character in support of the contentions which he made in his previous book, and which have already received general agreement.

The present survey shows that a very large proportion of the grass lands of Wales is little better than in a state of nature. It might almost be said that these areas are worse than in a state of nature, because events have taken place which have reduced their fertility and consequent feeding value.

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Unless strong measures are taken the remaining fertility and feeding value of these large areas will progress in a declining scale until they are completely useless for any human purpose. This conclusion is an inevitable result of reading Mr. Davies' survey, and is emphasized in Professor Stapledon's introduction.

Although this may sound as if the situation were desperate, the writers have no hesitation in pointing out that it can be readily made hopeful. The reclamation of this land is a simple matter; how it can be done is well known: all that is necessary is to do it in order to increase the value of the land itself and its capacity for food production. Not only is this of value in itself, but it also has wide implications, social and economic, that should be given the very gravest consideration.

The whole book is written by realists, the work was done by realists; there is nothing in the nature of wild theory behind their statements, and very complete evidence of their rational attitude of mind is supplied in the whole tone of the book; but a particularly good example is that where they describe how rushes spread.

"In our humid climate rushes can grow on quite dry land. Given the opportunity they will become established on normal soils, and if the pasture is starved of nutrients or if the grazing management is bad, then rushes already established will tend to become competitive and will spread. Being relatively unpalatable to stock, the rushes are further helped to spread in relation to the remainder of the herbage because they are normally not grazed by stock. Rushes are, in fact, quite sensitive to cutting or grazing just as are other plants. Measures to control them by means of the grazing animal and the mowing machine can therefore be employed."

The control of this weed is therefore a simple matter, and improvement of the botanical composition of most of the pastures described must be equally simple—it is only to be hoped that this book will stimulate its doing.

The Weekly Weather Report (March 3, 1935, to February 3, 1936.) Vol. LII. Pp. 72. (London : His Majesty's Stationery Office. Price 7s. 6d., post free, 7s. 8d.)

This publication, issued by the Meteorological Office, contains data relating to temperature, rainfall and sunshine for each week in the twelve months from the beginning of spring, 1935, to the end of the following winter period. The tables are arranged so that the whole sequence of data (with differences from the average) for a single station occupy one page. The principal tables give data in this form for 57 selected stations, well distributed over the British Isles. Other tables show the average values for the twelve climatological districts of the British Isles and the difference from average in each week and in each of the four seasons. Rainfall was in excess of the average in all districts except South Ireland, the excess ranging from 3 per cent. in North Ireland to 33 per cent. in South-East England. In most districts sunshine was also in excess of the average, though there was a deficiency of 5 per cent. in South-West England and South Wales, and the Channel Islands. Mean temperature was above the average in England and South Ireland, but in Scotland and North Ireland it was slightly below.

The Agricultural Landowner's Handbook on Taxation. Fifth Edition, revised and enlarged by R. Strachan Gardiner, F.S.I., F.L.A.S. Pp. 251. (London : Central Landowners' Association, 7, Charles Street, S.W.1. 1936. Price 6s.)

Apart from the usual periodical revision to keep abreast of changes in land taxation, a new edition of this handbook has been necessitated by the passing of the Tithe Act, 1936. The chapter on tithe rentcharge has been

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enlarged to include a comprehensive summary of the Act, and information has been added concerning stamp duties, licence duties and national insurance contributions. As Lord Clinton points out in his introduction, the book will serve as a useful guide for those whose constant duty it is to translate legislation, departmental rulings and High Court decisions into the practice of estate management.

Young Farmers. Pp. 32. Illus. (London : National Federation of Young Farmers' Clubs, 16, Russell Square, W.C.1. 1936. Price 9d.)

This interesting and attractive brochure is profusely illustrated, and gives a very readable account of the aims and objects of the Club movement. Each aspect of the Clubs' activities, which include the care of animals, stock judging and various forms of study and recreation, is illustrated by numerous photographs, with short explanatory notes. At the end of the booklet there is a short history of the National Federation and of the movement generally. This publication can be strongly recommended to those who wish to obtain a bird's-eye view of the scope and purpose of a movement that is gaining increasing support up and down the country.

Milk and Milk Products. By C. H. Eckles, D.Sc., W. B. Combs, M.A., and H. Macy, Ph.D. Pp. xiii + 386 and 92 Figs. Second Edition. (London : McGraw-Hill Publishing Co., Ltd. 1936. Price 21s.)

This American manual will be of use to students preparing for technical examinations in dairying, and should also find a place in the offices of dairy managers, analysts and foremen engaged in milk factories. The subject-matter consists of a fairly comprehensive survey of the nature and properties of cows' milk, separate sections dealing with the manufacture of butter, cheese, condensed and dried milks and ice cream. Special chapters on the testing of milk and on microbiology are included. No attempt has been made to cover the entire field of dairying; the processes of milk secretion, and extraction, and indeed of milk production in general, are specifically excluded from consideration. The fundamental importance of the health of the dairy cow in determining the quality of milk, is mentioned in the text, but more emphasis might have been placed on the value of routine veterinary inspection in this connexion. A notable omission is the absence of any reference to the phosphatase test, in use nowadays for ascertaining the efficiency or otherwise of the pasteurization process. The use of chemicals for sterilizing dairy utensils is advocated, although preference is given to steam or boiling water. This well-bound volume is excellently printed on good quality paper, and provided with appropriate illustrations.

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- Loss of Young Pigs: A Breeder's Experiences and his Solution.
A. Gruzelier. (Pig Breed. Annu. 16 (1936-37), pp. 82-86.)
- Breeds of Sheep: Characteristics Described. *N. A. Bowman.* (J. Dept. Agric. Vict. 34, 5 (May, 1936), pp. 226-235.)
- The Relative Profitableness of Producing Bacon and Pork. *H. R. Davidson.* (Pig Breed. Annu. 16 (1936-37), pp. 31-39.)
- A Method for Judging Pork and Bacon Carcasses. *H. R. Davidson et al.* (Pig. Breed. Annu. 16 (1936-37), pp. 49-64.)
- Change in Market Receipts of Fat Cattle since the Introduction of the Subsidy. *R. P. Askew.* (Fm. Econ. (July, 1936), pp. 46-48.)
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- Studies on Reproduction in Cattle. Part II. The Influence of Environmental Factors on Reproduction. *J. Anderson.* (Emp. J. Exp. Agric. (July, 1936), pp. 197-207.)
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- The Trend of Milk Prices in the Eastern Counties. *P. E. Graves.* (Fm. Econ. (July, 1936), pp. 44-46.)
- Giving the Consumer the Manufacturing Milk. *S. M. Makings.* (Fm. Econ. (July, 1936), pp. 41-44.)
- Winter Food Requirements for Milk Production. *C. V. Dawe, J. E. Blundell.* (Fm. Econ. (July, 1936), pp. 38-39.)
- Some Costs of Manufacturing Milk in Welsh Factories. *W. H. Jones.* (Welsh J. Agric. 12 (Jan. 1936), pp. 97-112.)
- The Titration of Milk and Whey as a Means of Estimating the Colloidal Calcium Phosphate of Milk. *E. R. Ling.* (J. Dairy Res., 7, 2 (May, 1936), pp. 145-155.)
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- The Influence of Storage, Pasteurization, and Contamination with Metals on the Stability of Vitamin C in Milk. *C. H. Whitnah, W. H. Riddell and W. J. Caulfield.* (J. Dairy Sci. 19, 6 (June, 1936), pp. 373-383.)
- The Reduction of Methylene Blue at 15·5° C. (60° F.) as a Test of Keeping Quality of Milk. *A. L. Provan, F. J. Dudley and S. B. Thomas.* (Welsh J. Agric. 12 (Jan., 1936), pp. 130-135.)
- The Nutritive Value of Proteins for Milk Production. IV. A comparison of the Proteins of (a) Spring and Autumn Grass, (b) Grass conserved as silage (A.I.V. Acid treated, Molasses treated and ordinary untreated) and (c) Grass conserved by drying, with Notes on (i) the effect of heat treatment on the Nutritive Value, and (ii) the supplementary relations of Food Proteins. *S. Morris, N. C. Wright and A. B. Fowler.* (J. Dairy Res. 7, 2 (May, 1936), pp. 97-121.)
- Studies on the Chemistry of Cheddar Cheese Making. IV. Lactose and Lactic Acid in Whey and Curd: the presence of bound water in Curd; the Existence of a Donnan Equilibrium between curd and whey; and the rate of penetration of salt into curd. *F. H. McDowall and R. M. Dolby.* (J. Dairy Res. 7, 2 (May, 1936), pp. 156-175.)

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- Chronic Progressive Pneumonia of Sheep, with Particular Reference to its Etiology and Transmission. *G. T. Creech and W. S. Gochenour.* (J. Agric. Res. 52, 9 (May 1, 1936), pp. 667-679.)
- The Gapeworm Problem. *T. I. Davies.* (Welsh J. Agric. 12 (Jan. 1936), pp. 205-209.)
- The Estimation of the Heat Production of Cattle from the Insensible Loss in Body Weight. *H. H. Mitchell, T. S. Hamilton.* (J. Agric. Res. 52, 11 (June, 1936), pp. 837-854.)
- The Mechanical Aspect of the Nutrition of Farm Stock. *E. J. Sheehy.* (Sci. Proc. Roy. Dublin Soc. 21 (New Series), 29 (July, 1936), pp. 257-280.)

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- Progress in the World's Food-Canning Industry. (Bull. Int. Tin Res. and Dev. Counc. (Feb., 1935), pp. 4-10.)
- The Development of the British Canning Industry. (Bull. Int. Tin Res. and Dev. Counc. (Feb., 1935), pp. 11-27.)
- Investigations on Fruit Products. V. The Concentration of Fruit Juices by Freezing, with Special Reference to Apple Juice. *V. L. S. Charley.* (Ann. Rep. Agric. and Hort. Res. Stn., Long Ashton (1935), pp. 150-161.)
- Investigations on Fruit Products. VI. Fruit Syrups. A. Production of Fruit Syrups. B. Use of Pure Fruit Syrups in Milk Beverages. *V. L. S. Charley.* (Ann. Rep. Agric. and Hort. Res. Stn., Long Ashton (1935), pp. 162-183.)
- Investigations on Fruit Products. VIII. Production of Fruit Wines. A. The Effects of (a) Dilution of the Juice, and (b) the Addition of Press Cake. B. The Effects of (a) Type of Sugar, and (b) Type of Yeast used for Fermentation. C. Yeast Nutrition in Fruit

WIRELESS TALKS TO FARMERS

Wines. Progress Report. *V. L. S. Charley.* (Ann. Rep. Agric. and Hort. Res. Stn., Long Ashton (1935), pp. 192-216).

Low Temperature Keeving of Cider. *V. L. S. Charley.* (Ann. Rep. Agric. and Hort. Res. Stn., Long Ashton (1935), pp. 138-144.)

WIRELESS TALKS TO FARMERS, JANUARY, 1937

<i>Station and Date</i>	<i>Time : p.m.</i>	<i>Speaker</i>	<i>Subject</i>
National :			
January 4	6.20	Mr. Anthony Hurd	
" 11	6.20	Mr. Anthony Hurd (with another speaker)	Pedigree Stock.
" 18	6.20	Mr. Anthony Hurd	Fruit.
" 25	6.20	Mr. Anthony Hurd	
Midland :			
January 14	6.40	Mr. H. G. Robinson	For Midland Farmers.
North :			
January 1	6.40	Prof. J. A. Hanley	Store Cattle breeding and rearing in Cumber- land, Westmorland and Durham.
" 8	6.40	Mr. W. S. Shewell- Cooper	New Year Resolutions for Northern Gardeners.
" 14	6.40	Mr. A. McVicar	Employment of Power on the Small Farm.
" 29	Not fixed	Prof. J. A. Hanley and Mr. W. B. Mercer	Grass Production and Utilization.
Scottish :			
January 6	6.40	Rt Hon. Walter Elliott	For Scottish Farmers.
" 14	6.35	Mr. Allan Fraser	For Scottish Farmers.
" 22	6.40	Mr. J. E. Wilson inter- viewed by Mr. W. J. Wright	Fowl Paralysis.
Western :			
January 7	6.30	Not Settled	For Western Farmers.
" 9	8.55	Messrs. John & Wilfred Eley	Handing down from "Father to Son" in farming.
" 11	9.30	Messrs. E. B. Beer, F. C. James, and G. Sutton	Plough Monday.
" 14	6.40	Not Settled	
" 19	8.45	A Research Worker, a County Horticultural Superintendent, and a Railway Official, in- troduced by Mr. A. W. Ling	For Western Farmers. Flower Growing in the West.
Wales :			
January 7	9. 5	Mr. Tom Jones	Clearing Old Orchards.
" 8	7.30	Messrs. Moses Griffith, T. H. Parry and R. T. Vaughan	Mountain Sheep and Shepherding.
Northern Ireland :			
January 1, 15	7.30	Mr. Peter Fitzpatrick	Farmers' Work and Worry.
" 8	8. 0	Mr. N. R. Knowles	The Bacteriologist and the Control of Dairying problems.

THE JOURNAL OF THE MINISTRY OF

AGRICULTURE

VOL. XLIII No. II

FEBRUARY, 1937

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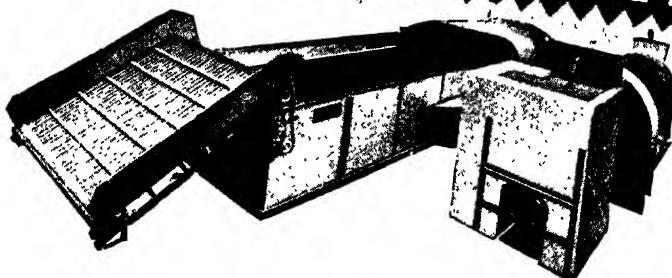
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THE JOURNAL OF THE MINISTRY OF AGRICULTURE

Vol. XLIII No. 11 February, 1937

NOTES FOR THE MONTH

International Grass Land Congress, July, 1937

THE Fourth International Grass Land Congress will take place in this country next July under the presidency of Professor R. G. Stapledon, Director of the Welsh Plant Breeding Station and the Imperial Bureau for Plant Genetics (Herbage Plants), Aberystwyth. Previous Congresses in this series have been held in Germany in 1927, in Sweden and Denmark in 1930, and in Switzerland in 1934. At the forthcoming Congress delegates are expected from all the more important European and American states, from the Dominions and Colonies, as well as from other countries throughout the world.

The paper-reading sessions will be held in Aberystwyth from July 13 to 19, and will consist of three plenary and two sectional sessions. Before and after the sessions tours will be made to centres of grassland interest, including the Cahn Hill Improvement Scheme, the experimental station at Cockle Park, Northumberland, and selected colleges, farm institutes and experimental stations. The tours have been so arranged that participants may have an opportunity of inspecting British grassland farming, including live stock management, over as wide a range as possible.

The sectionalized sessions will deal with the following aspects of the subject under discussion: (i) Ecology (including surveys), pasture and range management (including erosion control); (ii) Seeds mixtures (including lucerne for grazing), and legumes for use in poor pastures; (iii) Plant breeding, genetics and seed production; (iv) Manures and fertilizers; (v) Nutritive value of pastures, and fodder conservation; (vi) Grassland economics.

The following options will be available for delegates: (i) Attending paper-reading sessions and local Aberystwyth tours only, July 13-19; (ii) Assembling at Oxford, proceeding via selected centres of grassland interest to Aberystwyth, and participating in sessions and local tours, July 8-19;

NOTES FOR THE MONTH

(iii) Attending paper-reading sessions and local tours, and proceeding from Aberystwyth to Newcastle and Edinburgh, where they will disperse, July 13-23; (iv) Assembling at Oxford, proceeding to Aberystwyth, attending paper-reading sessions and local tours, and proceeding thence to Edinburgh, i.e., the entire tour comprising options (i), (ii), and (iii).

Full particulars regarding terms of admission and accommodation, acceptance of papers and dates for receipt of abstracts and typescript of papers, may be obtained on application to The Joint Secretaries, Agricultural Buildings, Alexandra Road, Aberystwyth, to whom all communications concerning the Congress should be addressed.

The Cotton Collection of Bee-Keeping Books

THE Ministry's Library has recently acquired on loan the valuable collection of books on Bee-keeping made by the late Revd. W. C. Cotton, a well-known bee expert and writer on Bee-keeping in the middle of last century, and one of the founders and Vice-Presidents of the British Bee-keepers' Association.

Mr. Cotton, who is chiefly remembered for his work in connexion with Bee-keeping in New Zealand, was born in 1814 and died in 1879, and left his library in trust for the use of the Incumbent of the Living of Frodsham. The present incumbent, the Revd. Dr. M. W. Myres, has, after consultation with Mr. W. Herrod-Hempsall (the Ministry's Technical Adviser in Bee-keeping), and with the consent of the Chester Diocesan Registrar, arranged for this Collection, which contains over 200 works in English, French, and German, to be housed on loan in the Library of the Ministry, where it is available for consultation to all interested persons.

Garden Birds

THE Ministry issues a series of leaflets that deal with most species of birds* which are considered to be of special interest to the agriculturist. Other birds, however, although perhaps not of major importance, are worthy of mention, and it is proposed to discuss here the habits of a few species ordinarily associated with gardens and orchards.

Foremost among our garden birds are the blackbird and the

* The Ministry's bird leaflets, numbering 23, dealing with some 40 species of birds, have been combined in the form of a portfolio. Copies of the portfolio, which is bound in an attractive cover, may be obtained from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 1s. 6d. each ; post free 1s. 8d.

NOTES FOR THE MONTH

song-thrush. In normal years both species are common in most cultivated areas, and at no time has either been reduced to anything like rarity in this country. This is so, in spite of the facts that both birds habitually build in exposed situations where their nests are easily seen, that hundreds of nests are destroyed annually by various means, and that their eggs are usually among the first acquisitions of the bird-nesting schoolboy. It is true that both species rear two, or even three, broods in a season, but even so their continued abundance is a little surprising.

To consider the blackbird first; it may be said at once that this bird does a great deal of damage in the fruit season. It is very partial to cherries, and also to currants, gooseberries and other bush fruit. In many districts it is a decided nuisance in the fruit season, and most gardeners and fruit growers keep a wary eye on its activities. On the beneficial side, the blackbird destroys numbers of noxious insects, slugs, and other pests. It is one of our finest songsters, in the opinion of many people the best of them all; but even so it is to be feared that, on balance, this bird cannot be regarded as good for a garden or an orchard when fruit is ripe or ripening.

The habits of the song-thrush are to a certain extent similar to those of the blackbird. It is, however, much less prone to take fruit, and from a horticultural point of view is, on the whole, definitely a beneficial bird. It is very fond of snails, of which it eats large numbers. This habit alone should be enough to commend it to the gardener. As a singer it is inferior to the blackbird, but is by no means negligible in this respect.

The robin, one of the best known and most likeable of all our birds, may be placed high up in the list of beneficial species. The worst that can be said of it is that it occasionally takes a little fruit, and its feeding habits generally can result in nothing but good to the gardener and the fruit grower. It destroys many pests of orchard and garden—caterpillars and grubs of various kinds as well as winged insects. It also eats worms, slugs, and sometimes wild seeds and berries. It is one of the boldest and most confiding of our native birds, and is the subject of a good deal of superstition. It is probable that this last circumstance has no small part in securing its immunity from harm at the hand of man. It enjoys a popularity that is not achieved by any other British bird, and no sensible person is likely to molest it.

The hedge-sparrow, a rather shy and retiring little bird,

NOTES FOR THE MONTH

is common in most districts. Its title is a misnomer, since it is not related to the sparrows and is vastly different in physical structure and general appearance. Of all our garden birds the hedge-sparrow is, perhaps, the most blameless. So far as can be ascertained, it does no damage of any kind, but is, on the contrary, a highly beneficial bird and a desirable acquisition to any garden. Its food for the most part consists of insects of various kinds—aphides, beetles, sawflies and other winged pests, and their larvae. Wild seeds and berries are also included in its diet, and in the winter it is a frequent visitor to the bird table. It has a short but tuneful and pleasing song. Its nest and its beautiful blue, unspotted eggs are very well known to most country-folk.

The wren, a tiny bird whose appearance and demeanour have aptly been described as “perky,” is a general favourite with bird lovers. It, also, is a very beneficial bird, its food consisting mainly of insects and small garden pests generally. Its domed and cleverly constructed nest is found in all sorts of odd corners, and this bird seems to have a special aptitude for adapting its nest to the peculiarities of any situation in which it chooses to build. Care should always be taken when examining a wren’s nest, as the bird is apt to desert it on very little provocation. The song of the wren is musical and clear, and of a surprising volume for so small a bird.

The foregoing are the principal and commoner garden birds that are not included in the Ministry’s series of leaflets. There are, of course, many other species that visit gardens from time to time. Of these, mention may be made of the white-throat, lesser whitethroat, garden warbler, willow warbler, blackcap, nightingale, and chiffchaff. All of these are beneficial birds and should be welcomed by any owner of a garden or an orchard.

Village Halls : Extension of Facilities

It is common knowledge that for years past the National Council of Social Service (26, Bedford Square, London, W.C.1) have administered a Fund, provided by the Development Commission and the Carnegie United Kingdom Trust, to assist the building of Village Halls by means of loans and grants. Over 350 Halls have been built in this way at a total cost of about £300,000, of which £57,000 has been loaned to villages and repaid without a single default, and about £40,000 has been paid in grants voted by the Carnegie

NOTES FOR THE MONTH

United Kingdom Trust. The National Council have recently issued the revised terms on which financial assistance can be obtained by villages for building Village Halls or for improving existing ones.

So far, only *loans* have been available for *improvement* of Village Halls, grants having been restricted to building only. In the future, however, owing to the generosity of the Carnegie United Kingdom Trust, improvement schemes will also be eligible for *grants*.

The type of scheme that will be eligible under this new provision may include extension of existing buildings, installation of heating, lighting or sanitary systems, and other improvements designed, for instance, to make a Hall more suitable for stage performances, physical training classes, or to meet the requirements of the licensing authorities. Generally speaking, the amount of grant allowable will be up to one-sixth of the cost, with a maximum of £75, and the amount of interest-free loan allowable will be up to one-third of the cost, with a maximum of £175. A rider to this arrangement is to the effect that in the case of small villages that have a population of less than 400 and find it difficult, if not impossible, to raise sufficient funds to build a Hall or to improve an existing one, the Trustees will agree to the proportion of grant aid being increased, possibly up to one-third of the cost of the scheme.

The National Council confidently hope that these additional facilities will enable villages to carry out many long-needed improvements to their Halls or, where a village has no Hall, will act as a source of encouragement to start a building scheme that will provide a Hall that will be a permanent addition to the amenities and beauty of the village.

International Congress of Agriculture at the Hague

THE XVIIth International Congress of Agriculture, organized by the International Agricultural Commission, will be held at The Hague next June, under the patronage of H.M. the Queen of the Netherlands. According to present arrangements the Congress will be officially opened on June 17, and will close on June 21. The subjects for discussion will include agricultural education, co-operation, live stock production, organization of the dairy industry, rural crafts and industries, rural economy, rural housing, vegetable cultivation, viticulture, and the place of women in

NOTES FOR THE MONTH

agriculture. Membership will consist of members of the International Agricultural Commission, delegates from agricultural associations, technical or scientific institutes concerned with agriculture, and individual members. Full information regarding the Congress may be obtained from The Secretary, International Agricultural Commission, 18 rue de Bellechasse, Paris.

Dairy Produce

THIS publication* is one of the Imperial Economic Committee's valuable "Commodity Series," which provides in summary form the chief statistical data of world production and trade for the commodities concerned. The material is well set out and includes in a small space a vast amount of useful and interesting information. Dairy products resisted the depression longer than most other farm commodities, but prices declined until 1934, by which time they had fallen farther than agricultural produce in general. The prices of butter and cheese were halved between 1929 and 1934, but part of this fall has been recovered during the last two years. This recovery appears to be mainly due to the check to production in the Southern hemisphere, to the emergence of the United States of America as an importer, and to increased consumer demand. Egg prices fell much less severely than those of milk products.

During the last six years, butter consumption has been rising generally; in the United Kingdom the estimated *per capita* consumption was over 7 lb. higher in 1935 than in 1929. Consumption of butter is higher in British countries than in those foreign countries for which statistics are available but, on the other hand, European countries consume more cheese than any of the British Dominions or the United States. Canada, the Irish Free State, and the United States of America all consume well over two hundred eggs per head in a year, whereas the corresponding figure for the United Kingdom is 150, and for Germany 117.

International trade in butter has continued to increase between 1929 and 1935, although exports from European countries have declined. World trade in cheese declined by about one-fifth in the same period; Empire shipments of cheese were fairly well maintained until 1934, but since then have declined. International trade in eggs has been reduced

* *Dairy Produce : A Summary of Figures of Production.* Pp. 66. (London : His Majesty's Stationery Office. 1936. Price 2s. 6d.)

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even more sharply, the volume declining by over one-third between 1929 and 1935, while imports into the United Kingdom dropped by 20 per cent. during the same period. Two interesting Appendices are added, setting out the import duties and quantitative restrictions in force in various importing countries. In the second Appendix it is surprising to find Canada classified as a foreign country.

Market Supply Committee

THE Minister of Agriculture and Fisheries, the Secretary of State for Scotland, and the Secretary of State for Home Affairs, acting jointly, have appointed Mr. Francis Beattie and Mr. Geoffrey Peto, C.B.E., to be members of the Market Supply Committee, which was constituted under the Agricultural Marketing Act, 1933, to advise Ministers in connexion with arrangements for the regulation of imports of agricultural products into the United Kingdom. The other members of the Committee are Sir David Milne-Watson, Professor W. G. S. Adams, and Mr. Frank Hodges.

Sir David Milne-Watson has been appointed Chairman of the Committee in place of the Marquess of Linlithgow who resigned the post upon his appointment as Viceroy of India.

Mr. A. R. Manktelow has been appointed Secretary of the Committee in place of Mr. E. M. H. Lloyd, and the offices of the Committee have been moved to 7, Whitehall Place, London, S.W.1. All communications for the Committee should be sent to the Secretary at the foregoing address.

Colorado Beetle in Germany and Luxemburg

IN consequence of the spread of the Colorado Beetle into Germany and Luxemburg, the Minister of Agriculture and Fisheries made an Order—The Importation of Plants (Amendment No. 2) Order of 1936—which imposes restrictions on the importation into this country from Germany and Luxemburg of certain kinds of horticultural produce. Similar restrictions are already in force in the case of horticultural produce from France and Belgium. The new Order came into force on January 11, 1937.

The following is a summary of its provisions:

(a) A Colorado Beetle Certificate in one of two forms is required to accompany living plants, potatoes, raw vegetables, and cider apples imported from Germany or Luxemburg.

(b) The alternative forms of Colorado Beetle Certificate are (i) that the produce was grown outside a radius of

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50 kilometres from an outbreak, (ii) that the importation is permitted by a general licence granted by the Minister, and that the conditions laid down in the licence have been observed. Alternative (ii) is not applicable to potatoes.

Copies of the Order (S.R. & O. 1936, No. 1288), price 1d. each net, may be obtained from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2.

Honey Research at Rothamsted

A substantial grant has recently been made to the Rothamsted Experimental Station to permit beekeeping researches to be broadened to include the investigation of various problems connected with honey. The appointment of Dr. C. R. Marshall to undertake this work has been approved, and Dr. Marshall recently took up his duties. In view of the fact that beekeepers during the past three years have contributed towards the cost of the brood disease investigations, the Government is bearing the whole cost of this new work.

The researches on honey will be physico-chemical in nature, and directed towards certain practical problems of quality and processing that affect the honey producer. Such problems are the granulation of honey, rapidity of granulation, texture of grain, "frosting," etc., and fermentation.

Dr. Marshall recently obtained the degree of Ph.D. at the University, Birmingham, where he has been working on chemical problems connected with the structure of mucilages.

International Annual of Agricultural Legislation

THE twenty-fifth issue of the *Annuaire International de Législation Agricole*,* just published by the International Institute of Agriculture, Rome, contains the most complete collection available of legislation dealing with finance and customs, plant and live stock production, land tenure and agricultural training, plant diseases and pests, agricultural co-operation, agricultural credit and insurance, rural ownership and internal settlement, legislation concerning the relations between capital and labour in agriculture, rural hygiene and the policing of the countryside. In the various chapters bearing the above headings are grouped the laws, orders, and regulations adopted on these subjects in all countries of the world. The most important provisions are reproduced in full, and for the others the title and complete references are given.

* Obtainable from the Institut International d'Agriculture, 1 Villa Umberto, Rome. Pp. lxxx + 926. Price 75 liras.

THE SECOND CONFERENCE ON MECHANIZED FARMING

THE Second Conference on Mechanized Farming was held at Rhodes House, Oxford, from January 5-8 inclusive. It was organized under the joint auspices of the School of Rural Economy, the Agricultural Economics Research Institute, and the Institute for Research in Agricultural Engineering in the same way as the First Conference last year (reported in this JOURNAL, February, 1936, pp. 1093-1107).

It is not too much to say that the Conference was an unqualified success. Not only was the attendance much larger than last year, but the papers led to enthusiastic and sometimes extremely critical discussion.

The papers read fall into 4 categories dealing respectively with Tractor Performance and Cultivation, the Maintenance of Fertility, Grass Drying, and the use of Combine Harvesters.

Tractor Performance and Cultivation. The paper on Tractor Performance in Theory and Practice was given by Messrs. S. J. Wright and E. B. Black. It dealt fully with the questions of loading the tractor, of oil dilution, and the cost of running. Mr. Wright said that: " Practically all modern tractors undergo standard tests, either in America or in this country, and their test performances are known. In particular, these tests determine the maximum draw-bar horse power that the tractor is capable of exerting in each gear over the full length of a test track." With this information it should be possible to load the tractor fully, but Mr. Wright is of the opinion that the majority of tractors in use in this country are worked below their rated loads. The question of crank-case oil dilution is intimately connected with that of tractor loading. In Mr. Wright's own words: " Because tractor drivers do not ordinarily change their oil more frequently than every 40 hours or so; and because modern research indicates that, quite apart from dilution, engine wear is accelerated by low engine temperatures, it follows that cold running is a potential source of much unnecessary expense to tractor users. Now what is the bearing of all this on the question of loading the tractor fully in

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practice? Well, first of all, it is obvious that under-loading means, in general, a lower engine temperature; and, when the tendency already is to run engines too cold, this is an immediate cause of heavy dilution and high wear. Again, the adjustment of carburettors and vaporizers cannot be varied from one minute to another. Naturally enough they are normally set to give a mixture suitable for full load work—otherwise the tractor would not produce its full power when called upon to do so—and if they are used for light work, and particularly for intermittent work, conditions will, once more favour heavy dilution. We have heard of some very striking instances of this; a tractor of well-known make required practically a new engine after only twelve months' service—simply because its owner was so proud of it and careful not to overload it, that it was underloaded all the time; another tractor employed on a golf course, where there was naturally little heavy work to do, required expert attention three or four times every year; the owner of another odd-job tractor had his oil tested after what he regarded as a normal-period running, and found a dilution of 69 per cent.—appreciably more diluent than oil in the sump!"

"The moral is: load your tractors as fully as possible, and if light work involving much starting and stopping must be done, run on petrol and not on paraffin."

The consequence is that Mr. Wright and his colleague come to the conclusion that: "An average tractor working 800-1,000 hours per annum, costs about £150 a year to run. We estimate that, taking the average case as we have seen it in the field, about one-third of this could be saved; directly by full loading and indirectly by avoiding depreciation. There are something like 40,000 tractor users in the country and they are probably wasting £2 million a year between them."

Six papers were read on Cultivation. Their titles were: Row-crop Cultivations of Sugar-Beet, Tractor Cultivation of Potatoes with Row-crop Attachment, Row-crop Equipment, the Scientific Basis of the Art of Cultivation, Some Modern Cultivation Problems, and A Farmer's Views on Cultivation Experiments. It is not easy to summarize these papers, but they gave rise to very considerable discussion, and on the morning of Wednesday the criticism of the scientific papers, by Mr. Arthur Amos, was received with some acclamation. Perhaps a significant quotation is the introduction to Mr.

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Culpin's paper. It runs: "A survey of aims and methods of cultivations in Britain makes it readily apparent that, speaking generally, mechanization has, so far, produced little fundamental change in traditional objects and methods. In the main, the cultivations on modern, mechanized farms are carried out by tractors hauling strong multi-furrow tractor ploughs, tractor cultivators, harrows, and rolls, and doing almost exactly the same cultivations as were done in a more leisurely way a few years ago by teams of horses."

Farmers rely upon experience and judgment to determine the work that should be done in any season in preparation for a particular crop. New inventions and the use of mechanical power for cultivations suggest that, in the future, traditional methods may be the subject of a revolution, but extreme caution appears to be necessary because scientists have not yet come to definite conclusions.

As Mr. Culpin says: "Bearing in mind, then, the new possibilities in cultivation opened up by mechanical power, it is necessary to ask what soil conditions are required by various crops growing on the various soil types. The answer can only be given by finding out how each cultivation affects the soil and thereby the growth of crops. Examples of the specific questions thus raised are: What effects are produced by a deep-working implement like the Fowler "Gyrotiller"? What kind of seedbed does winter wheat require? What is the effect of rolling winter wheat in spring?"

"This paper attempts to deal with such questions as these, but I must warn you at the beginning that there are no definite answers to any of them." This last sentence is the conclusion that was come to by everybody who took part in this discussion, paper-readers and farmers as well. It is useful here to state the substance of the criticisms made by Mr. Amos with regard to the existing methods of scientific investigation. It is contained in the conclusion to his paper, as follows:

"It will be apparent that at the bottom of all my criticisms is a definite conviction that modern statistical experimentation is too rigid to be of service in studying cultivation. Once upon a time the statistician was a humble servant who did what he was told. He was used, for example, by Professor T. B. Wood, to check and criticize a large mass of loosely designed experiments in stock feeding and crop manuring—and very useful he was too. But to-day the statistician is allowed to

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dominate all agricultural experimentation autocratically, and no one dares to carry out an experiment on anything agricultural without first bowing to his rule. The result, so far as cultivation problems are concerned, is that the essential features are swamped by a mass of mathematics. If cultivation is a science, it is the only one in which the mathematician is allowed to control research, and the only one in which progress is negligible. If, on the other hand, as I believe myself, cultivation is still an art, then mathematics have nothing to do with it."

" Let me finish on a constructive note. I suggest that we should concentrate at present on purely qualitative research. Let us, for instance, follow the sort of line so ably developed by Rogers and others at East Malling. They contrive to put glass windows in the soil so that they can study by eye the actual growth of plant roots. If the same sort of thing were done in connexion with some of Mr. Culpin's work, it might be possible to observe exactly how the roots react to different textural conditions; in particular it might be possible to observe how roots negotiate, or fail to negotiate, hollows deliberately produced in the seed-bed. We could then find out what effect to look for, and decide which out of the many complications are relevant, and later we might put our conclusions to the direct test of quantitative experiment."

Maintenance of Fertility. The discussion of this subject was opened by Mr. D. Skilbeck and no more precise conclusions emerged from the discussion of this subject than from that on Cultivations. An interesting paper was presented on behalf of Sir Albert Howard, who was unable to attend owing to illness. It dealt with what is known as the Indore Process of using waste products of agriculture for fertilizers. Since this has been widely discussed and details will be found in the publications referred to by Sir Albert, it will be sufficient to give the references here. Details of the Indore Process will be found in the following publications: *The Waste Products of Agriculture*, Oxford University Press, 1931; *The Manufacture of Humus by the Indore Method*, Royal Society of Arts, John Street Adelphi, W.C.2, 1935. In the course of this discussion Dr. E. M. Crowther presented a concise account of the existing position of fertilizer science in relation to humus. Mr. W. D. Hollis gave an interesting outline of the practical methods he had adopted to maintain

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soil fertility on farms in various parts of the country. Mr. D. R. Bomford added a contribution in which he cast some doubt upon the necessity for the use of animal manures. He said there was no precise knowledge extant on this subject and that he considered dungism to be in the nature of a religion. He thought that ideas about the maintenance of fertility were matters of opinion rather than matters of fact.

Grass Drying. The part of the Conference that undoubtedly excited the most interest was that devoted to grass drying, in the course of which the following papers were read: A Year's Progress in Grass Drying, Mr. E. J. Roberts; Practical Experiences with Grass Drying Equipment—(a) Grass Drying on a Mixed Farm with a Ransome Drier, Mr. J. E. Chambers, (b) Grass Drying with a Curtis-Hatherop Drier, Mr. A. G. Bazley, (c) Notes on Grass Drying on a Dairy Farm (I.C.I. Drier), Col. R. Vaughan-Williams; The Production of Dried Grass and its Cost: Some Preliminary Observations, Mr. R. N. Dixey and Mr. R. P. Askew; Some Speculations on the Future of Grass Drying, Professor J. A. S. Watson.

The first paper by Mr. E. J. Roberts covered every aspect of the subject because he had spent part of the year in visiting all the places where grass drying was in progress, he has seen the makers of plant, and had many discussions with interested persons. The primary matter is, of course, the production of grass for drying, and Mr. Roberts states that: "The consensus of opinion amongst producers, so far, is that there is no need to "punish" a field by subjecting it to frequent cutting for more than one season. It is considered that better all-round results will be obtained by alternating this with grazing and haying. Some producers consider that it is unnecessary even to reserve a particular field for grass-drying for one year, and that it is better to graze for a portion of the season. There is a firm minority, however, that holds that, if possible, the same fields should be reserved for the production of dried grass, because there is less danger of including such impurities as dead grass, soil from uneven ground, etc., in the product." With regard to the requirements of a good drier he states that: "A good grass drier should evaporate water efficiently without causing deterioration in the quality of the product; furthermore, this should

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be done at such a rate as to give a reasonable output, having regard to the requirements of the farm." It is, perhaps, best to state his conclusions, as follows:—

" 1. The artificial drying of grass made rapid progress in Britain in 1936, there being nearly 50 centres in operation at the end of the season. The tendency is strongly in favour of small units, while abroad large units are employed.

" 2. In the production of young, leafy herbage, differences of opinion exist as to the relative advantages of reserving fields for one or more seasons for continuous cutting and of having a rotation of cutting, grazing and haying.

" 3. The moisture content of the fresh grass has an important bearing on costs of drying, and on the throughput.

" 4. Much of the grass dried in 1936 had reached a stage of growth too advanced for the production of the best quality of dried grass. Ensilage and haymaking should be resorted to in order to prevent this.

" 5. Costs of production are higher than was anticipated, but where the product has been sold, prices have been obtained that are higher than was expected initially."

Actual producers next gave their experiences of the costs of production and the use of the product. The paper by Messrs. Dixey and Askew on costs of production during 1936, is the most informative on this subject and it seems to indicate that dried grass can be produced for between £5 10s. and £6 10s. a ton. The value of the product on the farm can be roughly assessed from these figures, but, as the writers say, " Speaking more generally, the figures which we have been considering are, perhaps, rather higher than some of us had hoped to find, and to that extent they are disappointing. But it must be remembered that grass-drying is still in its early stages, and experience has to be paid for. Any new process must go through a pioneering stage which is bound to be relatively costly. Farmers who have incurred high costs appear to be sufficiently optimistic to hope that they will be able to reduce their costs in future." . . . " When we speak of reducing the costs in future, we do not mean that startling reductions are promised for this year or next. It is not yet that grass drying will take its place as a normal activity of ordinary farming, and it may be that the pioneers will have to continue earning our gratitude for some little time to come."

Professor Scott Watson summed up the position in a

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masterly manner, and his final words on the subject were : " Taking the outlook as a whole, there is reason for moderate optimism about the future of grass drying. A total cost of the order of £6 per ton, as given in the paper by Dixey and Askew, is not to be regarded as depressing. A fair sample of the material, allowing nothing for its peculiar virtues, is worth this sum. Most of the plants costed have been in the semi-experimental stage. There is need for economies at every stage of production. But it is not unreasonable to hope that sufficient improvement will be achieved to put the process on a sound financial basis."

Combine Harvesters. The combine harvester is now becoming almost a commonplace in British farming, although it was first introduced only 8 years ago. Mr. Hosier, whose name is well known to all farmers, has only recently become converted, and he read the introductory paper: " My First Year with Combine Harvesters." This was followed by, " A Review of Combine Harvesting in 1936 " by Mr. J. E. Newman. It is interesting to learn that Mr. Hosier was instrumental in getting crops for the first combine harvester to work in, and that still earlier he had tried to persuade another farmer to introduce one. Since he is so well known for his own innovations it is amusing to learn that he was dubious about the practical use of the combine harvester in this country. His experiences last season have, however, entirely converted him. Mr. Newman's review was as comprehensive as most of his papers are.

CONTROL OF POULTRY DISEASES

THE following memorandum describing the action of the Ministry under the Diseases of Animals Act, 1935, was issued on December 9, 1936:—

1. The purpose of this memorandum is to provide an outline of the course of action which the Minister of Agriculture and Fisheries, after consultation with the Department of Agriculture for Scotland and the Poultry Advisory Committee, has decided to pursue in the exercise of the powers conferred upon him by the Diseases of Animals Act, 1935, for the control of contagious diseases of poultry in Great Britain.

2. In determining the nature of the action to be taken it is necessary to take into consideration the practical effect on the industry of compulsory measures by way of notification entailing veterinary examination and consequential restrictions on the movement of birds from infected premises and areas.

In view of the prevalence among poultry stocks of certain diseases such as fowl pox, bacillary white diarrhoea, fowl typhoid, tuberculosis, and of coccidiosis and the other parasitic infestations, and also to a less extent of fowl cholera and contagious bronchitis (laryngo-tracheitis), any attempt at compulsory measures of the kind above referred to would unduly interfere with the normal business of poultry keepers. It is not, therefore, proposed to make such diseases compulsorily notifiable, and the Ministry is informed that the industry does not desire such action. Moreover, the high administrative costs involved would be out of proportion to the advantage to be gained. Nor is such action considered necessary to secure the control of the diseases mentioned in view of the voluntary methods now available to poultry owners which are happily becoming more generally recognized and practised. These diseases will consequently be dealt with as at present by the issue of Advisory Leaflets; and through the work of existing educational institutions, supplemented where necessary by inquiries and advice by the Veterinary Inspectors of the Ministry. The notes on some of the existing poultry diseases contained in paragraphs 3 to 5 of this memorandum may be helpful. Fowl pest, which does not at present exist in this country, is, however, in a different category. The action to be taken in the event of its introduction is described in paragraph 6.

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3. Fowl Pox, Fowl Typhoid, Bacillary White Diarrhoea.

As a result of research carried out in recent years at the Ministry's Laboratory at Weybridge and elsewhere, considerable progress has been made in the methods of eliminating certain of the most prevalent of the contagious diseases of poultry, and adequate measures for the control of these diseases are available to poultry owners. For example, vaccines are available for fowl pox and fowl typhoid and a reliable blood test has been established for fowl typhoid and for bacillary white diarrhoea. The present facilities at the Ministry's Veterinary Laboratory, New Haw, Weybridge, Surrey, will be continued. At that institution post-mortem examinations, blood tests for the diagnosis of fowl typhoid and for the detection of adult "carriers" of bacillary white diarrhoea, and other bacteriological work on poultry are carried out at reasonable charges, and vaccines are obtainable for use against fowl pox and fowl typhoid. It is open to poultry keepers whose birds are dying, or who have other evidence of disease in their flocks, to avail themselves of these facilities or of those provided by other laboratories.

Representations have been made from certain quarters urging that fowl typhoid should be made compulsorily notifiable, but this disease does not lend itself readily to legislative action. The symptoms of fowl typhoid are not diagnostic and it would be difficult to enforce notification. It is most frequently met with on insanitary farms and is not likely to gain a hold on premises where hygienic conditions are reasonably satisfactory. It is of interest that it has not been found possible to induce this disease experimentally at the Ministry's Laboratory. Further, the availability of the blood test for diagnosis and of the vaccine already referred to places the control of the disease and protection against it very largely in the hands of individual poultry owners. There is no indication, from the present evidence, that fowl typhoid is increasing.

Avian Tuberculosis. Measures of control are also available for this disease, including the use of the tuberculin test for diagnosis.

4. **Fowl Cholera.** Any cases of fowl cholera in England and Wales which come to the knowledge of the Ministry are notified to the Veterinary Investigation Officers of the respective provincial centres who advise the owner as to the

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best methods to pursue to limit his losses and prevent the spread of infection. This procedure will be continued. In the event of any outbreak of this disease in Scotland being brought to the notice of the Ministry, arrangements will be made for inquiries to be made and advice given by one of its Veterinary Inspectors.

The mild form usually found in this country does not lend itself to complete eradication. The control of the importation of poultry imposed by the Order No. 2 described in paragraph 6 below will minimize the risk of introducing a virulent form of this disease into Great Britain from abroad.

5. Contagious Bronchitis (Laryngo-tracheitis). The Ministry has recently considered the question of dealing by administrative Order requiring notification, etc., with contagious bronchitis of poultry (infectious laryngo-tracheitis). A number of independent and widely scattered outbreaks of this disease have been discovered in England since the beginning of 1935. How or when the disease was introduced has not been established, but it would seem that it has been present unrecognized for several years. In no instance has it been possible to show any relation with a previous outbreak. Mortality varies considerably in individual cases, but on the whole, is not high. Control of the disease is rendered more difficult by the fact that recovered birds act as carriers. At present it is impossible to distinguish in the initial stages between the two types of the disease, one of a virulent character with comparatively heavy mortality and the other a mild form with a low death rate. Further research work is needed on this disease. In view of the character of the disease and the circumstances in which it can be spread, the adoption of a slaughter policy in the case of this disease is not likely to result in its eradication. Further, such measures would in any case involve stringent restrictions, including closure for at least 28 days, of all premises where the poultry stocks were traced as having been exposed to infection by contact either at markets or otherwise with diseased poultry, a course of action which it is understood is not favoured by poultry owners. Even this measure would not disclose the existence of "carrier" birds which may be the cause of an outbreak at a very much later date. In other countries where the disease is prevalent no effective official action is considered possible, and owners are left to take

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voluntary steps to minimise their losses. Where cases of the disease are brought to the notice of the Ministry in this country, it is proposed to follow the same procedure as that described in paragraph 4 relating to Fowl Cholera. The Ministry's Advisory Leaflet No. 250 gives the owner advice as to the steps which should be taken, and this Leaflet will be widely distributed.

Legislative Action—New Orders.

6. Having regard to the conditions under which the poultry industry is carried on at the present time in Great Britain, legislative action is directed to three main purposes, namely:—

(i) Provision for dealing with the serious exotic diseases which if allowed to spread might have disastrous consequences to the industry. The only diseases at present coming within this category are those included in the term fowl pest (which includes fowl plague and Newcastle disease). The mortality in affected flocks sometimes reaches 100 per cent. but the disease does not exist at present in Great Britain. The disease is being made compulsorily notifiable by the *Fowl Pest Order of 1936* described below.

(ii) The control of the importation of live poultry, and of eggs intended for hatching, to prevent the introduction of fowl pest and also of contagious bronchitis (laryngo-tracheitis) and the virulent forms of fowl cholera. An Order with this object in view has been made entitled the *Poultry and Hatching Eggs (Importation) Order of 1936*, described in detail below. In framing this Order the opportunity has been taken of including in the prescribed veterinary certificate to accompany imported poultry and hatching eggs provisions to ensure their freedom from the more commonly existing diseases as well as from fowl pest. As fowl pest does not exist in Ireland, the Channel Islands or the Isle of Man, the provisions of the Order do not apply to poultry or hatching eggs brought from those countries.

(iii) The prevention, so far as may be practicable without unduly interfering with the poultry trade, of the spread of infection at markets and through the agency of poultry receptacles. It is not considered a practicable proposition effectively to prohibit the exposure of diseased poultry at markets partly on account of the administrative difficulties involved and partly because of the objection of the poultry industry as a whole to official interference in the case of the commonly existing poultry diseases. Action is therefore being limited to the compulsory cleansing and disinfection after each occasion of use of market pens and receptacles used for poultry. These requirements are imposed by the *Poultry Markets and Receptacles (Disinfection) Order of 1936*.

The three Orders mentioned, the provisions of which are summarized below, are the first statutory regulations to be imposed in Great Britain dealing with poultry diseases, and they are, of course, subject to alteration or addition as experience may prove desirable. It is hoped that all connected with the poultry industry and concerned in its welfare will

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co-operate actively with the Ministry and with Local Authorities in the observance of these regulations, which are made solely for the protection of poultry keepers and with the full concurrence of representatives of the industry.

(I) THE FOWL PEST ORDER OF 1936.

This Order came into operation on January 11, 1937, and applies to any form of fowl pest (including fowl plague and Newcastle disease).

(a) *Compulsory Notification (Article 1).*—The Order requires every person having in his possession or under his charge any poultry or the carcass of any poultry affected with or suspected of fowl pest to send a written notification immediately to the Director, Laboratory of the Ministry of Agriculture, New Haw, Weybridge, Surrey, giving the address of the premises where the poultry or carcass is, the name of the owner or person in charge, the approximate number of live poultry on the premises, and the approximate number of deaths (if any) during the preceding 28 days. *The owner is also required by the Order to despatch to the above-named Laboratory for examination the carcass of a diseased or suspected bird, securely packed in a box with sufficient absorbent material to prevent leakage and labelled with the name and address of the sender and with the words "Suspected Fowl Pest."* The box should not be sent by post, and if sent by rail must go by passenger train. No fee will be charged for the examination.

Veterinary Surgeons observing any suspected case must also notify the Director of the Laboratory in writing and call the owner's attention to his obligation to forward the carcass to the Laboratory. Any Veterinary Inspector who observes a suspected case is required to notify the Laboratory and also to forward the carcass to the Laboratory.

The diagnosis may occupy from 5 to 10 days.

(b) *Precautionary Restrictions pending Diagnosis (Article 2).*—The owner will be notified as soon as possible by the Ministry as to whether or not the diagnosis confirms the presence of fowl pest. Meantime, the owner is required by the Order :—

(i) to prevent the access of other poultry, or of any person except the attendant, to that part of the premises where any suspected bird or carcass is or was kept; and

(ii) to detain all other poultry on the premises except the dressed carcasses of healthy birds.

The attention of the owner will be called to this provision in a letter from the Ministry's Laboratory acknowledging the receipt of the notification of disease.

(c) *Diagnosis at Ministry's Laboratory (Article 3).*—The diagnosis will be determined at the Ministry's Veterinary Laboratory in all cases.

(d) *Declaration of Infected Place (Form A) and Application of Rules (Article 4).*—On confirmation of disease the Ministry will notify the Local Authority who are required to cause a Notice (Form A) as specified in the Schedule to the Order forthwith to be served on the occupier of the premises declaring an Infected Place and applying thereto certain Rules for the prevention of the spread of infection. Form A can only be withdrawn by the Ministry.

(e) *Compulsory Slaughter (Articles 5 and 6).*—Provision is made for the compulsory slaughter by and at the discretion of the Ministry of all

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affected stocks and of any stocks directly exposed to infection, with compensation for stock other than diseased stock so slaughtered to the extent of their value immediately before slaughter.

(f) *Cleansing and Disinfection (Article 7).*—Provision is made for such cleansing and disinfection of premises on which disease exists or is suspected as the Ministry's Inspector considers necessary.

(g) *Restrictions on Poultry exposed to Infection (Article 8).*—This Article requires an Inspector to serve a Notice of Detention (Form B) in respect of any other poultry stocks on premises which appear to have been exposed to infection. These Notices prohibit the movement of poultry into or out of the premises except by licence, and should remain in operation for a period of 14 days' duration from the last known date of possible contact with infection.

Symptoms of Fowl Pest.

The term "fowl pest" includes the diseases known as fowl plague and Newcastle disease. These are highly dangerous virus diseases which may cause heavy and rapid mortality.

Fowl Plague may affect domestic fowls, turkeys, geese, ducks and guinea fowls. The period of incubation varies from two to seven days and birds affected with the acute form are frequently found dead without exhibiting previous symptoms. The affected birds refuse food, are generally dejected, listless, feathers are ruffled and in some cases there is a discharge from the eyes and nostrils.

Newcastle Disease naturally affects the common fowl and may be transmitted to pigeons, ducks and geese. The period of incubation is from five to seven days. Affected birds refuse food but drink frequently, and stand in a crouching position. They assume a sleepy appearance with eyes half or fully closed, and wings and legs often become paralysed. The most characteristic symptom is seen in the respiratory system. There is a long gasping inhalation through the half open mouth accompanied by gurgling and a frothy exudate from the point of the beak.

(2) POULTRY AND HATCHING EGGS (IMPORTATION) ORDER OF 1936.

This Order, which will come into operation on February 15, 1937, controls the importation of (i) domestic fowls, turkeys, geese and ducks; (ii) day-old chicks of domestic fowls, and (iii) the eggs of domestic fowls intended for hatching. The Order—

(a) Prohibits the landing in Great Britain of *live poultry of the above species (other than day-old chicks)* from any other country except Northern Ireland, the Irish Free State, the Channel Islands and the Isle of Man, with the proviso that :—

(i) Consignments may be landed with a licence previously obtained from the Ministry and subject to such conditions as may be prescribed.

(ii) Small consignments of poultry, other than geese, not exceeding 21 birds (estimated to include about three breeding pens) may be landed if accompanied by a certificate signed by a Veterinary Officer of the Government of the country of origin to the effect that there has been no outbreak of fowl pest within a radius of 15 miles of any premises on which the poultry have been kept during the previous six months ; that, in the case of domestic fowls and turkeys, they were tested for bacillary white diarrhoea, fowl typhoid and tuberculosis within the

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preceding month and found to be free from those diseases ; and that the poultry to be imported, and the flocks from which they were brought, were also free from fowl cholera, contagious bronchitis, fowl pox and fowl paralysis.

(b) Prohibits the landing in Great Britain from any other country except Northern Ireland, the Irish Free State, the Channel Islands and the Isle of Man of *day-old chicks of domestic fowls, or the eggs of domestic fowls declared on the Customs entry to be intended for hatching*, or the use of such eggs for hatching, unless the chicks or eggs are accompanied by a certificate signed by a Veterinary Officer of the Government of the country of origin to the effect that during the period of six months preceding the proposed date of shipment (a) the fowls from which the eggs were produced and (b) the poultry on the premises on which the chicks were hatched, have been free from fowl pest and have not been kept on, nor within 15 miles from, any premises where fowl pest then existed or had previously existed within the said period of six months ; that the fowls from which the chicks and/or eggs were produced had, within the preceding six months, been tested and founded free from bacillary white diarrhoea, and fowl typhoid, and had not subsequently been in contact with untested birds or with reactors ; and that the flocks from which the chicks and/or eggs were produced were also free from fowl cholera, contagious bronchitis, tuberculosis, fowl pox or fowl paralysis.

(c) Prohibits the transhipment at a port in Great Britain of poultry brought from any country except Northern Ireland, the Irish Free State, the Channel Islands and the Isle of Man.

Special provision is made for dealing with poultry landed in contravention of the above regulations.

(3) POULTRY MARKETS AND RECEPTACLES (DISINFECTION) ORDER OF 1936.

This Order came into operation on January 11, 1937, and will require the cleansing and disinfection in the prescribed manner of :—

(a) Every pen or other enclosure and every bench, stand or other fitting used for poultry in any market, fairground, saleyard, highway or other premises where live poultry are habitually exposed for sale as soon as practicable after being used for that purpose and before being again so used ; and

(b) Every receptacle used for the conveyance of poultry to any place in Great Britain or for the exposure for sale of poultry, as soon as practicable after each load of poultry has been removed, and before being again used for poultry. Similar cleansing and disinfection is required of receptacles (after the poultry have been discharged) which are to be returned empty or sent by railway, hired road vehicle, vessel or aircraft, before they are so despatched.

The prescribed process consists of a thorough and effectual cleansing followed by a thorough washing or spraying with a 4 per cent. solution of washing soda, this being free from the risk of tainting. The sweepings of the pen, droppings, litter, etc., are required to be effectually removed from contact with poultry.

THE CHOCOLATE SPOT DISEASE OF BROAD AND FIELD BEANS*

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CHOCOLATE SPOT disease is widespread in England and Wales, and affects both broad and field beans. Symptoms range from a well-defined chocolate-coloured spotting of the foliage and streaking of the stems, to a "blight" in which the lesions coalesce, causing partial defoliation, blackening and death of the plants. The former, or "non-aggressive" type of infection, may appear from December onwards, but unless very severe it does little damage, and the foliage produced subsequent to the attack is often free from spots. The latter, or "aggressive" type of infection, usually develops only in the four months April to July, and four or five years often elapse between serious epidemics. When epidemic "aggressive" infection does occur, it is capable of destroying a bean crop very quickly.

Chocolate Spot also affects sainfoin and vetches and the damage done may occasionally be serious. The symptoms of infection are similar to those seen on beans.

Mention may be made of certain agents causing symptoms resembling those of Chocolate Spot and frequently confused with that disease. The exudate (honeydew) of the black bean aphid causes chocolate-coloured spotting that should be termed *Aphis Injury*; it is in no way related to true Chocolate Spot. Chocolate-coloured discoloration caused by frost is fairly common in the early part of the year, but is usually diffuse, the foliage presenting a "scorched" appearance, frequently accompanied by distortion of the shoots. Mechanical injury, such as friction against the ground, may also produce diffuse chocolate discoloration of bean shoots. Two leaf

* For a detailed account of the investigation, see WILSON, A. R.: The Chocolate Spot Disease of Beans (*Vicia Faba L.*) caused by *Botryotis cinerea* Pers., *Ann. Appl. Biol.*, XXIV, 1937 (in the press). Dr. Wilson held one of the Ministry's Agricultural Research Scholarships from 1931 to 1934, during which period he carried out a considerable amount of work on Chocolate Spot Disease. From October, 1934 to October, 1936, he continued his investigations on this problem with the aid of a Carnegie Scholarship and a research grant from the Agricultural Research Council.

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spot fungi, *Ascochyta Fabae* Speg. and *Cercospora Fabae* Fautr., produce on bean leaves lesions that, in their initial stages, resemble those of true Chocolate Spot.* The diseases caused by these fungi are of little economic importance in Britain.

The Cause of the Disease. The cause of Chocolate Spot has been the subject of considerable controversy during the past fourteen years. For many years the causal agent of the disease in Britain was considered to be *Bacillus Lathyri* Manns and Taubenh.,† a bacterium which, in the light of recent research, is now considered to live only on dead material and not to cause any specific disease. The present investigation, begun in Cambridge in 1931, has shown beyond any doubt that the common grey mould fungus, *Botrytis cinerea* Pers., is the cause of Chocolate Spot in Britain.

Infection. *Botrytis cinerea* grows on almost any kind of plant debris such as fallen leaves, etc., on which, under moist conditions, large numbers of minute greyish spores are formed. These are blown by wind or splashed by rain on to the surfaces of bean shoots and may remain dormant there for more than a month. If weather conditions are suitable, however, the spores germinate at once and the fungus penetrates the underlying tissues. The first visible sign of infection is the appearance of very small black spots on the leaves and streaks on the stems. These lesions enlarge and turn brown within five days. Healthy bean plants tend to resist the spread of the fungus in their tissues, and, therefore, the infection may be localized; in this case the symptoms are those of "non-aggressive" infection. If, however, very large numbers of spores germinate on the shoots and penetration occurs in many places, this resistance is broken down and the fungus spreads freely in the tissues, giving rise to the symptoms of "aggressive" infection. When plants are weakened by the influence of some soil factor their resistance is lowered and they succumb to "aggressive" infection more easily than a healthy crop. Patches of stunted plants in a field are often killed by the *Botrytis* while their healthy neighbours

* WOODWARD, R. C.: *Cercospora Fabae* Fautrey on Field Beans, *Trans Brit. Mycol. Soc.*, XVII, 1932, 195.

† PAYNE, S. G., and LACEY, M. S.: Chocolate Spot Disease or Streak Disease of Broad Beans, This JOURNAL, XXIX, 1922, 175.

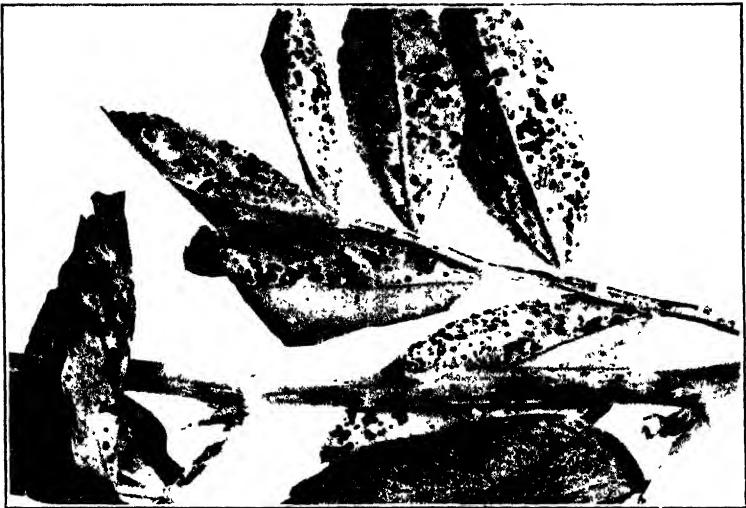
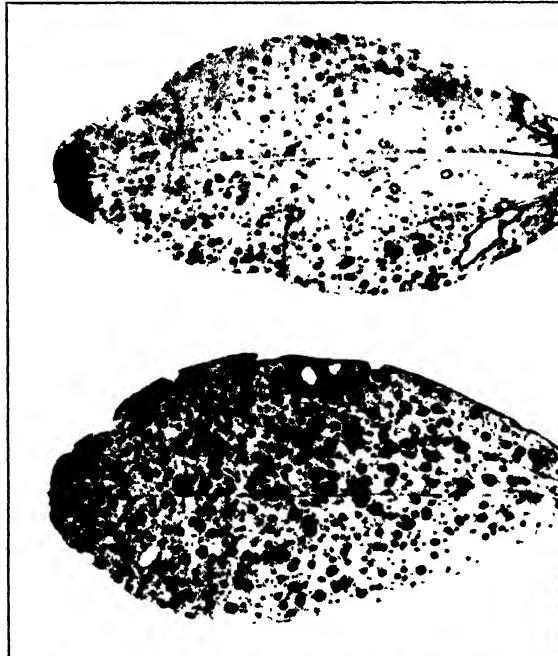


FIG. 1. (Above) Field bean leaves showing severe, non-aggressive chocolate spot infection of the non-aggressive type.

To the left, field bean shoot killed by natural, aggressive infection, and bearing large numbers of spores of the fungus on the surface.

FIG. 2. (Right) Shoot of field bean taken from a plant growing in a field plot, and showing artificially widened, non-aggressive and slight "aggressive" chocolate spot infection. The foliage was sprayed, during wet weather, with a spore suspension of *Botryosphaeria cinerea* in water.



Plates Dr A. K. Wilson.

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show only the localized lesions of "non-aggressive" infection. Under suitable conditions vast numbers of spores are formed on dead plants, and these act as centres of infection for the rest of the crop.

Conditions Favouring the Disease. Infection does not occur unless there is a film of moisture present on the plants; any factor tending to cause evaporation of such a film will, therefore, reduce the chances of attack. The conditions favouring epidemics are prolonged periods of wet weather and high humidity to ensure plentiful spore production and the establishment and maintenance of a water film on the plants, little or no wind to cause evaporation of the film, and an air temperature between 55° F. and 77° F.

Certain soil conditions have been found to favour the disease by weakening the plants. Potash and phosphate deficiency of the soil has been found by several workers to render the disease more severe. The writer has observed that potash deficiency may increase the severity of "aggressive" attack but has little influence on "non-aggressive" infection. Sour soil and waterlogging have also been observed to increase the severity of Chocolate Spot.

Control. The investigation has revealed no satisfactory method of control of the disease. The chances of the disease assuming epidemic proportions are, however, reduced if care is taken to correct potash and phosphate deficiency,* sour soil and poor drainage. Spring-sown beans have been found less subject to Chocolate Spot, but are more so to *aphis* infestation.

The writer wishes to record his indebtedness to Professor F. T. Brooks, of the Botany School, Cambridge, and to express his thanks to Advisory Mycologists in many parts of Britain.

* SCOTT WATSON, J. A.: Notes on Manuring, This JOURNAL, XLIII, 1936, 178.

THE COMPOSITION AND FEEDING VALUE OF HEATHER AT DIFFERENT PERIODS OF THE YEAR

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THE increasing economic importance of grass as an agricultural crop has been a striking feature of the last decade, and both chemists and botanists have rightly given time and attention to its study under every conceivable treatment and condition. The non-graminaceous plants that make such a valuable contribution to our upland grazings have been almost completely ignored. Of such plants, heather (*Calluna vulgaris*) is probably the commonest, and certainly the most useful, the gross annual value of the crop being much greater than is generally realized.

As a fodder plant, heather differs from grass in one important respect; it is an evergreen, and being fairly resistant to frost, can and does provide keep throughout the whole year. It is the staple diet of the red grouse, which eats it at all seasons and is, in winter, entirely dependent on it. On many hill farms the Blackface sheep subsists largely on heather, except during the few weeks that are spent on in-by land at lambing time.

Very little is known of the extent to which hill sheep consume the different plants—ericaceous and graminaceous—that go to make up the moorland sward. On typical “black land,” which may carry 90 per cent. or more of heather, it is obvious that this plant must provide a very large proportion of the food at all times of the year. It is true that for a brief period during early spring the draw-moss or sheathing cotton-sedge may make a valuable contribution to the diet, and that other moorland plants are eaten to a limited extent during the summer and autumn. On moor that has been recently burned the role of such subsidiaries takes on an added importance. In the winter months, however, heather must be regarded as the staple food of sheep on “black land”; when there is much snow lying, if may be the only food that sheep can reach.

As a result of the work of Wilson and Leslie* much detailed and accurate information as to the diet of the grouse

* “The Grouse in Health and in Disease” (Final Report of the Committee of Enquiry on Grouse Disease). Vol. I, 67-87.

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is available. These workers examined several hundreds of crops, obtained at different periods of the year, from 33 counties in England and Scotland, and were able to arrive at estimates of the proportions of heather and of subsidiary foods consumed during each month. It was shown that, at any time between September and May, not less than about 80 per cent. of the food eaten was heather, and that in March and April heather shoots constituted nearly 100 per cent. of the diet. During spring and early summer heather continued predominant, despite the fact that a number of subsidiary foods were then available. Only in July did consumption fall to any serious extent; during this month heather was displaced by nearly 50 per cent. of blueberry and other subsidiaries. This state of affairs continued to some degree during August, when an abundant supply of berries is available on many moors; thereafter the birds consumed little but heather.

It appears, therefore, that, on "black land," both the hill sheep and the grouse subsist largely on heather at all times, and that during the winter months they are almost entirely dependent upon it. Despite this, the nutritive value of the crop at different seasons of the year has never been seriously studied, and no reliable information as to the quality of winter heather is available. It has been customary to assume that the crop is of highest feeding value when the new shoots appear in May, and that there is a consistent fall to a minimum in winter. Wilson and Leslie* state that "just as the first flush of early pasture is more nourishing than the later growth, the first heather shoots of spring probably contain a larger percentage of nutritive value than at any other time of the year, and it is doubtless due to this cause that grouse make such rapid progress in size and strength between the date of hatching in May, and the opening of the shooting season some 10 or 12 weeks later." Both of the assumptions contained in this paragraph are reasonable, but it may be as well to remember that they are assumptions and nothing more. With the second one, viz., that the rapid growth of young grouse is due to the superior quality of spring heather, the writer is not at present concerned, although it is possible that certain of the supplementary foods are no less important in this respect than heather. The

* *Ibid.*, Vol. I, 72.

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question of seasonal variation in the composition and feeding value of heather is one that is capable of investigation, and it was considered that the collection of some reliable data would prove of interest.

Material for the purpose of this investigation was obtained from the hill farm of Newbiggen, Blanchland, Northumberland. The heather, which is on "dry moor" at an elevation of not less than 1,100 feet, is exceptionally well managed, being burned on a regular 10-year rotation. Areas that had been burnt 3, 5, and 7 years previously were sampled on 4 occasions during the summer and autumn of 1934 (June 20, July 23, September 12, and October 12), and once during the winter of 1934-35 (January 12). Each sample was made up of a large number of random cuttings taken within a radius of 12 yards from a central marking-post. That portion of leaf and stem estimated to be of the current season's growth, and which would comprise most of the material eaten by sheep and grouse, was separated by hand picking and thereafter dried and ground. The usual analytical methods were employed in the examination of samples, but an attempt to determine the digestibility of the crude protein *in vitro* was abandoned. Artificial digestion with a hydrochloric acid solution of pepsin, a method which, when applied to pasture grass, gives coefficients comparable to those obtained *in vivo*, appears to be quite unreliable with ericaceous plants. The analytical results obtained are tabulated below.

From the above figures it appears that, in the youngest heather, crude protein is at a maximum in June. In samples taken during late summer and autumn the protein content is appreciably lower, but there is little evidence of any consistent decline with the advancing season. The January sample, in which a minimum value is reached, shows that there has been a substantial fall during the winter. In the older heather, material collected in June is not outstanding, but loss of protein is evident in October, the samples taken during this month being little better than those of January. The total range of variation shown by the 5- and 7-year heather is, however, quite small, and, in the latter, can be regarded as negligible. The ratio of true to crude protein never falls below 0.85, and considerably exceeds this figure in all samples taken later than June. It would be reasonable to anticipate that the spring growth will show a relatively higher non-protein nitrogen content, and this has been

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TABLE I.—PERCENTAGE OF DRY MATTER.

	Sampling Date	June 20	July 28	Sept. 12	Oct. 12	Jan. 12
3 years after burning	*Crude protein ..	12.93	10.16	9.55	10.12	8.74
	Ether extract ..	1.29	2.37	5.10	4.09	3.46
	Fibre ..	17.80	19.36	21.23	17.99	17.73
	†Ash ..	4.81	4.34	4.26	4.15	4.05
	N-free extractives ..	63.08	63.77	59.86	63.96	66.02
	*Including :—					
	True protein ..	12.26	9.43	8.68	9.36	8.59
	†Including :—					
	Phosphoric acid (P_2O_5) ..	0.38	0.41	0.30	0.32	0.31
	Lime (CaO) ..	0.87	0.78	0.69	0.72	0.60
5 years after burning	True/crude protein ratio ..	0.96	0.93	0.91	0.92	0.98
	*Crude protein ..	8.59	8.75	8.47	7.86	7.65
	Ether extract ..	2.94	3.83	4.51	4.28	3.86
	Fibre ..	19.59	20.62	21.11	20.25	18.05
	†Ash ..	3.46	3.29	3.12	3.55	3.14
	N-free extractives ..	65.41	63.74	63.05	64.30	66.76
	*Including :—					
	True protein ..	7.34	8.52	8.32	7.67	7.56
	†Including :—					
	Phosphoric acid (P_2O_5) ..	0.27	0.27	0.26	0.23	0.21
7 years after burning	Lime (CaO) ..	0.67	0.78	0.81	0.76	0.85
	True/crude protein ratio ..	0.85	0.98	0.98	0.98	0.99
	*Crude protein ..	7.46	7.52	7.43	7.22	7.10
	Ether extract ..	3.31	3.51	4.16	4.31	4.24
	Fibre ..	20.92	21.13	20.84	20.12	20.11
	†Ash ..	3.92	3.79	3.75	3.87	3.18
	N-free extractives ..	64.39	64.05	63.82	64.48	65.37
	*Including :—					
	True protein ..	6.43	7.03	7.34	7.16	6.95
	†Including :—					
	Phosphoric acid (P_2O_5) ..	0.24	0.27	0.24	0.23	0.22
	Lime (CaO) ..	0.85	0.85	0.82	0.78	0.94
	True/crude protein ratio ..	0.86	0.93	0.90	0.99	0.98

realized in the 5- and 7-year samples. The high true-crude protein ratio in the June sample of 3-year heather is difficult to explain.

An inspection of the figures relating to fibre content discloses some interesting features. While the total range of variation is never large, the January samples of all ages actually contain less fibre than samples taken at any other

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period. At 3 and 5 years after burning a maximum is reached in September, but at 7 years, such differences as occur during summer and autumn are too small to be of significance. There is no good evidence of any inverse relationship between crude protein and fibre.

The oil or, more correctly, ether extract content of ericaceous plants is substantially larger than that of pasture grass, but its value from a nutritional standpoint is so questionable as to make the figures in Table I of minor interest. It appears, however, that seasonal variation is marked at all ages, but shows a tendency to become less in the oldest heather. Ether extract is at its lowest in June and rises consistently to a maximum in September or October. Winter heather contains rather less than is found in September and October, but in no instance is the difference considerable.

The two mineral constituents determined, viz., phosphoric acid and lime, both show appreciable seasonal variation in the youngest heather, being present in greatest amount during June and July, and falling to a minimum in winter. At 5 years after burning, phosphoric acid alone shows a similar tendency, and at 7 years there is no evidence that the percentage of either phosphoric acid or lime present is affected in the slightest degree by season.

The absence of digestibility data admittedly detracts from the usefulness of the results obtained, in that it does not allow the feeding value of the samples to be stated in the conventional way, i.e., in terms of starch and protein equivalents. The fact that there is little likelihood of such data becoming available does not make it any less necessary to interpret the results with caution; nevertheless, it should be possible to arrive at reasonable estimates of feeding value.

It may be concluded that young heather is at its best during early summer, and that thereafter its value declines to a minimum, which is probably reached in early winter. Although this decline is of significant magnitude it is less marked than might be anticipated. At 5 years or more after burning, season of the year appears to have a smaller effect on feeding value, and at 7 years, variation is very slight.

When these findings are considered in relation to the seasonal requirements of the sheep and grouse, it will be realized how well Nature has adapted the heather crop to be the mainstay of both species. Sheep will eat the youngest heather in spring and summer when its nutritive value is at

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a maximum, but during long periods of severe weather in winter nothing but upstanding heather may be available, and they must perforce fall back on older growth. As has been shown, the feeding value of this more mature heather has not depreciated to a serious extent, and being probably eaten in greater bulk it is well able to sustain life.

Adult grouse will not feed on young heather while they can find plenty of close-growing material of mature age; it is thus probable that their winter food is little inferior to that which they eat in summer and autumn. On the other hand, young grouse prefer the youngest heather, and, on well managed moors, they should have no difficulty in getting it. When it is no longer available to them, they are already adult and can subsist on the older growth. It has been stated by the workers previously referred to* that grouse need and eat five times more food per day between December and March than between October and November. While admitting that more food is required in winter to maintain the body temperature, it is contended that by far the greater part of this increased consumption can be accounted to the inferior food value of winter heather. If these views are accepted, it follows that heather must have a nutritive value which is, at a conservative estimate, two or three times greater in spring and summer than in winter. It need only be said that the results that have been discussed in this article provide no evidence that seasonal variation in nutritive value is of any such magnitude.

The writer desires to acknowledge his indebtedness to Jasper Stephenson, Esq., J.P., of Newbiggen, Blanchland, for his courtesy in providing facilities for this work.

* *Ibid.*, Vol. 1, 79.

THE EFFECT OF POULTRY ON THE CHEMICAL COMPOSITION OF HERBAGE AND SOIL

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Folded Poultry and Down Herbage. The folding system as practised on the drier calcareous soils in the West Country has proved popular on account of its relative simplicity, and because of the vast improvement in the Down pastures, which are now grazed by dairy cattle. Twenty-five adult birds are put in one fold unit and moved daily so as to cover one acre of land annually. This rate of stocking is low, since 50 to 60 birds per acre can be kept on free range with other farm live stock, but, in the type of unit under discussion, the 25 adult birds seem to be overcrowded and the number might perhaps be reduced to 15 with advantage to the health of the birds. When the improvement of the land is the main object in view, the system has a three-fold advantage: (1) the land is not fouled, (2) the droppings are deposited immediately and evenly without loss of soluble constituents, and (3) the concentration of 25 birds on an area of approximately 80 sq. ft. for one day subjects the land to intense mechanical treatment. This area does not include that covered by the night roost, and the folds should be so arranged and moved that the night roosts rest over areas scratched over on the previous day.

The valuable effect of poultry on poor pastures has to be seen to be fully appreciated. Thus, a typical old Down pasture containing up to 60 per cent. of fine-leaved fescue grasses (mostly tufted or matted) was in twelve months converted into a good second-grade cow pasture, containing a useful mixture of grasses and clovers. The improvement in the chemical composition of the herbage is shown in Table I.

The spring samples were taken after poultry had been folded over the land during the winter and early spring months, while the autumn samples were collected after the land had received similar treatment during the summer months. Table I shows the effect of folded poultry on Maiden Down. The practice resulted in large increases in

EFFECT OF POULTRY ON HERBAGE AND SOIL

TABLE 1.*—EFFECT OF FOLDED POULTRY ON THE NUTRITIVE VALUE OF
DOWNLAND HERBAGE

County: Soil Centre	SPRING HERBAGE (early June)				AUTUMN HERBAGE (early October)			
	Wiltshire Chalk Wexcombe 1		Wiltshire Chalk Wexcombe 2		Wiltshire Chalk Wexcombe 1		Gloucester Oolite Notgrove	
	Maiden Down	Folded Poultry	Maiden Down	Folded Poultry	Maiden Down	Folded Poultry	Maiden Down	Folded Poultry
Crude Protein	11.2	15.3	11.7	15.8	12.8	17.7	10.8	22.1
Silica-free Ash	5.9	7.8	5.6	9.3	3.3	5.1	5.2	9.3
Lime (CaO)	1.75	2.12	1.45	2.11	0.82	0.80	1.24	1.66
Phosphoric Acid (P_2O_5)	0.52	0.84	0.65	0.81	0.61	0.86	0.60	0.98

* All samples of herbage and soil in this investigation were taken in duplicate, but only mean results are reported.

† As percentage of the dry matter.

the crude protein, silica-free ash and phosphoric acid contents of both spring and autumn herbage, and indicates the value of poultry as a means of improving Downland pastures for cattle and sheep. Even for poultry (subsequently folded over the same land), the improved quality of the herbage may not be without significance, since Prentice and Co-workers^{1*} in Northern Ireland, and Price and Burdett² in Wiltshire, have shown that egg production and the health of laying birds may be satisfactorily maintained on a ration of cereals, supplemented only by limestone and salt, provided that the birds are running out on good pasture. On such low protein rations the birds consume pasture herbage to a far greater extent than normally, and this suggests that the protein requirements of laying birds can, in part at least, be supplied by young and leafy herbage.

Poultry in Pens. Samples of spring herbage from a large number of poultry pens in the West of England were examined. Most of the samples were taken from the pens at County Egg Laying Trials by courtesy of the County Agricultural Organizers and Poultry Instructors, who also kindly supplied information concerning the treatment of the pens. This information may be summarized as follows:—

At Laying Trial Centres the pens are usually 10 yards × 12 yards and provide an area of 20 square yards per bird.

* References are given on p. 1067.

EFFECT OF POULTRY ON HERBAGE AND SOIL

At some centres duplicate pens are available, making it possible to rest one of the pens for a period that varies from one month to one year. At all centres, lime at the rate of approximately 1 ton per acre is applied to the grass in the autumn. At all but one of these centres surplus grass in the pens is cut over two or three times a year. At the one exception, the pens are grazed by sheep, and, in spite of a certain amount of damage done to posts and wire netting by the sheep, it is claimed that this is more than compensated for

TABLE II.—EFFECT OF PENNED POULTRY ON THE CHEMICAL COMPOSITION OF THE DRY MATTER OF SPRING HERBAGE

Centre	Subsoil	Grazing of Poultry Pens	Untreated No Poultry or Grazing				Poultry Pens			
			Crude Protein	Silica-free Ash	Lime (CaO)		Crude Protein	Silica-free Ash	Lime (CaO)	
					Phosphoric Acid (P_2O_5)	Lime (CaO)			Phosphoric Acid (P_2O_5)	Lime (CaO)
Berks	(E) ..	Gravel ..	Cow 13.1	5.1	0.95	0.56	16.0	5.9	0.78	0.83
Bristol	(F 1)	Keuper Marl	Nil 12.1	4.9	0.84	0.50	13.1	6.1	1.12	0.81
Cornwall	(E) ..	Clay Slate ..	Nil 13.0	5.8	0.93	0.46	16.2	6.9	0.94	0.78
Devon	(E) ..	" Sand "	Nil 12.8	6.1	1.12	0.77	16.4	7.8	1.39	0.93
Dorset	(E) ..	Chalk ..	Nil 13.6	5.0	0.98	0.41	17.8	6.9	1.03	0.75
"	(F 1)	" ..	Cow 15.4	6.1	1.67	1.03	17.2	7.7	1.23	1.25
"	(F 2)	" ..	Cow 13.1	6.4	1.54	0.91	18.1	8.3	1.44	1.13
Hants	(E) ..	" ..	Nil 11.9	5.9	1.48	0.46	12.9	6.0	1.51	0.63
Middlesex	(E) ..	Gravel ..	Mixed 10.9	6.5	1.08	0.77	19.9	6.5	1.06	0.89
Wilts	(F 1)	Chalk ..	Nil 11.2	5.9	1.75	0.52	15.8	7.3	2.00	0.81
"	(F 2)	" ..	Mixed 9.3	7.1	2.32	0.82	15.7	8.0	2.22	1.13
MEANS			12.4	5.9	1.33	0.66	16.3	7.1	1.34	0.90

E = County Egg-laying Trials.

F = Poultry Farmer.

by the saving of labour and time that would otherwise be necessary to keep the grass in order by hand. On certain farms, Dexter and Jersey cattle have been employed with considerable success to keep the grass in check.

The results obtained from the chemical analysis of spring herbage from the pens and from untreated areas near to the pens are given in Table II.

The results given in Table II are similar to those in Table I; that is, there is a general improvement in the protein and phosphoric acid status of the herbage of all pens. The improvement is usually greatest where the pens are subjected

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to grazing by sheep and/or cows. The grazing animals prevent the development of fibrous tufts and help to maintain a more uniform sward.

Samples of autumn herbage were collected from poultry pens at six centres only, but Table III again suggests that

TABLE III.—CHEMICAL COMPOSITION OF AUTUMN HERBAGE OF
POULTRY RUNS AND PENS

Centre	Subsoil	No Poultry			Poultry Pens		
		Crude Protein	Silica-free Ash	Lime (CaO)	Phosphoric Acid (P_2O_5)	Crude Protein	Silica-free Ash
*Bristol ..	Keuper Marl..	11·3	5·3	0·66	0·93	18·5	6·8
Dorset ..	Chalk ..	14·5	6·8	1·63	1·00	18·0	7·1
" ..	" ..	11·2	4·9	1·30	0·66	17·4	7·0
Wilts ..	" ..	13·0	6·4	1·89	0·78	15·7	7·8
" ..	" ..	11·7	5·6	1·45	0·65	15·3	6·8
Worce ..	Keuper Sand-stone	13·2	5·1	1·01	0·70	22·0	7·6
MEANS ..	..	12·5	5·7	1·32	0·79	17·8	7·2
						1·03	0·98

* The soil at this centre was very acid, and an application of lime at the rate of 2 tons per acre increased the lime content of the herbage by 70 per cent.

poultry can exert a marked influence upon the composition of autumn herbage.

It is the custom to select dry light land for poultry, and for economic reasons poor grass land is commonly chosen. The data illustrate the relatively low value of the original

TABLE IV.—SEASONAL VARIATION IN CHEMICAL COMPOSITION OF SECOND GRADE NATURAL PASTURES IN THE WEST OF ENGLAND
(as percentage of dry matter)

	Jan.	Feb.	Mar.	Apl.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Crude Protein ..	14	15	15	19	19	13	16	16	15	16	15	16
Lime (CaO) ..	0·9	1·1	1·0	1·0	1·1	1·2	1·3	1·3	1·1	1·2	1·2	0·9
Phosphoric Acid (P_2O_5) ..	0·7	0·7	0·6	0·7	0·9	0·6	0·8	0·7	0·7	0·8	0·6	0·7

herbage of the poultry runs at the centres investigated. The crude protein content of this herbage is lower than that of herbage of second grade natural pastures at any month of the year, as will be seen from a comparison of Tables II and III with Table IV.

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The spring herbage of the poultry pens and runs is definitely superior in nutritive value to the original herbage, but even this improved spring herbage only approximates in composition to the herbage of second grade pastures. The autumn herbage, however, has a relatively higher nutritive value and surpasses the autumn herbage of natural pastures in its content of crude protein and phosphoric acid.

TABLE V.—CENTRE—DORSET F. 1

Composition of Dry Matter Per cent.	Spring Herbage				Autumn Herbage				
	Land not Stocked with Poultry	Pens			Land not Stocked with Poultry	Pens			
		Treatment during Winter		Stocked		Treatment during Summer			
		A. Rested	B. Stocked			A. Rested	B. Stocked		
Crude Protein ..	15·4	15·6	17·2		14·5	14·3	18·1		
Silica-free Ash ..	6·1	7·2	7·7		6·8	7·0	7·1		
Lime (CaO) ..	1·67	1·45	1·23		1·63	1·33	1·19		
Phosphoric Acid (P ₂ O ₅) ..	1·03	1·12	1·25		1·0	1·03	1·20		

TABLE VI.—CENTRE—DORSET F. 2

Composition of Dry Matter Per cent.	Spring Herbage				Autumn Herbage				
	Land not Stocked with Poultry	Pens			Land not Stocked with Poultry	Pens			
		Treatment during Winter		Stocked		Treatment during Summer			
		A. Rested	B. Stocked			A. Rested	B. Stocked		
Crude Protein ..	13·1	13·6	18·1		11·2	13·2	17·4		
Silica-free Ash ..	6·4	6·7	8·3		4·9	6·0	7·0		
Lime (CaO) ..	1·54	1·57	1·44		1·30	1·21	1·24		
Phosphoric Acid (P ₂ O ₅) ..	0·91	1·0	1·13		0·68	0·83	1·03		

At two centres, where one group of pens is occupied during the winter months and another group during the summer, samples of the herbage were collected from all the pens in the spring and in the autumn. The mean composition of the herbage in the winter and summer groups of pens was calculated, and the data obtained is set out in Tables V and VI.

The pens were stocked at an average rate of 240 birds to the acre, and when the herbage samples were collected the pens grouped under "A" (Tables V and VI) had been

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occupied by poultry for periods varying from four to six weeks.

The tables provide information on the relative feeding value of the herbage of poultry pens after six months' rest and after six months' occupation.

A comparison of the protein contents of the three types of herbage indicated in the tables, shows that the influence of the nitrogen in poultry manure does not extend beyond a period of six months. Tables V and VI also show that after six weeks' occupation of the pens, the birds have not appreciably affected the composition of the herbage. This has, however, no great significance, since a response in the herbage can be obtained within three to four weeks under normal weather conditions provided that the birds are concentrated fairly intensively on the land for a short period (e.g., 1,000 birds moved over 1 acre of land in a fortnight).

Effect of Poultry on the Chemical Composition of the Soil. Fresh poultry manure has a composition that may vary according to the type of food fed and the purpose for which the birds are kept. Moreover, after deposition it may undergo a variable amount of drying and admixture with soil and litter, and, therefore, collected samples of poultry manure may vary widely in analysis. As a guide, however, the following average analysis may be quoted:³

	Per cent.
Moisture	52.93
Organic Matter	29.30
Total Nitrogen	2.12
Total Potash (K_2O)	0.60
Total Phosphoric Acid (P_2O_5)	1.21
Total Calcium Oxide (CaO)	1.16

It is estimated that 25 laying birds excrete annually about 18 cwt. of manure of the above composition. Under the folding system an acre of land, therefore, receives an annual dressing of 40 lb. nitrogen, equivalent to 1½ cwt. sulphate of ammonia; 24½ lb. phosphoric acid (P_2O_5), equivalent to 1½ cwt. superphosphate, and 12 lb. potash (K_2O), equivalent to 25 lb. sulphate of potash.*

* These calculations are based on the assumption that a laying bird excretes approximately 2 grammes of nitrogen per day and approximately 3½ oz. of manure of the composition quoted above.

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It follows that an acre of land on which 240 birds are penned will receive nearly five times this quantity of manure, if it be assumed that only 50 per cent. of the droppings are deposited in the pen. Thus, a laying-trial pen during six months' occupation receives manure equivalent to 4½ cwt. sulphate of ammonia, 3½ cwt. superphosphate, and ½ cwt. sulphate of potash per acre.

This knowledge of the composition and quantity of manure deposited by a flock of poultry throws light on the changes in soil fertility that are observed when poultry are folded repeatedly or penned continuously on the same area of land.

Data illustrating the effect of poultry on a medium loam soil derived from the Keuper Marl formation are given in Table VII.

TABLE VII.—THE EFFECT OF PENNED POULTRY ON THE CHEMICAL COMPOSITION OF THE SOIL

	No Poultry	After 2 years Poultry	After 4 years Poultry	After 5 years Poultry
*Lime requirement (in cwt. of Calcium Carbonate per acre)	44·00	58·00	22·00	40·00
Available Phosphoric Acid (P_2O_5)%	0·011	0·013	0·056	0·063
Available Potash (K_2O)%	0·013	0·016	0·025	0·021

* The lime requirements were determined by the Hutchinson-McLennan method, and the available phosphate and potash by extraction with 1 per cent. citric acid (Dyer's method).

The lime requirement figures show that the original soil was deficient in lime to the extent of 44 cwt. calcium carbonate or approximately 1 ton quicklime per acre, and that in two years this deficiency had increased to 58 cwt. calcium carbonate per acre. An application of quicklime at the rate of 2 tons per acre in the third year considerably reduced the deficiency, but in the fourth year the lime requirement had risen to 22 cwt. and in the fifth year almost back to its original level.

Under the influence of poultry, lime is lost from this soil at an extremely rapid rate, and on sands and gravels there

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is an even greater tendency for lime to be leached from the surface soil.

The following calculation stresses the necessity for liming grass land under poultry:

If it be assumed that all the nitrogen in poultry manure is converted to nitrate, then a dressing of lime double the weight of nitrogen added in the form of poultry manure must be applied in order to maintain the supply of bases in the surface soil. This would mean that on land stocked with 250 head of laying birds per acre, approximately 800 lb. of burnt lime per acre would be required annually by the soil. Even this quantity of lime would appear to be insufficient, as it is necessary at most laying trials to apply burnt lime each year at the rate of 1 ton per acre.

The conclusion to be drawn from these data, and from field observations in general, is that frequent liming of poultry pens situated on acid soils should be a routine practice. It must also be stressed that when poultry are used to improve poor acid pasture, a full dressing of lime or limestone should be applied beforehand to obtain the full benefit of the manure and of the activities of the birds. This is borne out by a demonstration now being conducted in the West of England where poultry folded on acid pasture have grazed most closely on those strips of land that have received the full dressing of limestone (3 tons per acre) as determined by chemical analysis of the soil.

Data similar to those reported in Table VII have been obtained for soils from pens and folds on the Keuper Sandstone, Oolite, Gravel, and Lias formations, and the outstanding feature is the large increase in the available phosphoric acid in the surface soils after three years of poultry keeping; e.g., on Keuper Sandstone the available phosphate increased from 0.008 to 0.032 per cent. when poultry had been penned on the land three years, while, in the same period on Oolite, the available phosphate rose from 0.010 to 0.021 per cent.

An increase in the available potash was not always observed, and this soil constituent changed only in a very irregular manner. The effect of four or more years' continuous stocking with poultry is to cause the ratio of available phosphate to available potash to become abnormally high. This lack of balance has developed most strikingly in a chalk soil on which poultry had been established for over eight years.

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The pertinent data are given in Table VIII.

TABLE VIII.—THE "AVAILABLE" PLANT NUTRIENTS IN THE SOILS OF OLD-ESTABLISHED POULTRY PENS

Plant Nutrient	No Poultry	Poultry for 8 years	
		Pens A	Pens B
Available Phosphoric Acid (P_2O_5)%	0.009	0.120	0.120
Available Potash (K_2O)%	0.010	0.007	0.004

The average ratio of available phosphate to potash in this soil is 20 to 1, whereas in a good type of grass land soil the ratio is approximately 3 to 2 (i.e. $P_2O_5 = 0.03$ per cent., $K_2O = 0.02$ per cent.), although the ratio may be as high as 7 to 1 before the effects of the imbalance become appreciable. The condition in this soil is very similar to that observed by Blenkinsop⁴ in potato-sick soils in Devon and Cornwall, and further investigation may reveal that the same condition exists in all soils on which poultry have been kept intensively for eight or more years, and in soils that have sometimes been termed "poultry-sick." If so, the remedial treatment would be the application of a relatively heavy dressing of potash, e.g., 3 cwt. per acre of sulphate of potash or its equivalent, supported by severe harrowing, and, where the condition is extreme, a repetition of this treatment would probably be necessary in the succeeding year. Since the phosphate accumulates in the top few inches of soil, the most satisfactory treatment might be to plough up the pasture, apply potash and re-seed.

The high content of available phosphate in this soil was reflected in the high phosphoric acid content of the herbage, the average being 1.14 per cent. of the dry matter. This value is approached only on the best pastures when the herbage is kept closely grazed, while the dry matter of herbage on a good average pasture would contain not more than 0.8 per cent. of phosphoric acid.

Poultry and Grass Land Management. The combined management of poultry and grass land presents problems both to the specialist poultry farmer and to the grass land farmer, but whereas the former is concerned solely to provide range and green food for the birds, the latter is concerned

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with poultry also as a means of manuring and improving the land. Their problems will, therefore, differ.

In order to provide suitable range and green food for poultry, a dense sward of young, leafy grass must be maintained, and it is this object that the poultry farmer should seek to attain in the management of his grass land, whether it be used for permanent runs or for movable houses and folds. Poor land freshly stocked with poultry would require a dressing of phosphates and potash (e.g., 6 cwt. basic slag and 3 cwt. kainit per acre) to encourage the growth of good grasses and clovers.

The high nutritive value of young grass is now well established, but it is necessary to stress the fact that poultry, and young birds especially, can obtain little or no benefit from the long, coarse grasses and weeds that so commonly provide the herbage on fields where poultry are said to be "out on grass." Moreover, short herbage is desirable from the hygienic point of view since—as Taylor at Weybridge has pointed out—the excreta of birds, when deposited on short grass, are exposed to the drying action of air and sun, and are, therefore, given an opportunity to dry out before the larvae of those parasitic worms which have no intermediate host have reached the more infective stage.

In the management of poultry runs, the farmer is faced with the special problem of maintaining a sward on land stocked for six months and frequently throughout the entire year, at the rate of 200 to 400 birds per acre. This means that the land is treated excessively with an unbalanced manure. The immediate effect of this manuring is to stimulate an excessive growth of summer grass, making it necessary to mow or graze more frequently than would otherwise be necessary. The second effect is to bring about adverse changes in the soil, with subsequent deterioration of the turf. The nature of these soil changes has been described, but, to prevent or counter them, an annual application of lime (at the rate of $\frac{1}{2}$ to 1 ton per acre) is required, and also potash (at the rate of 3 cwt. of kainit per acre) once in every four years in order to maintain a balance with the phosphates added to the soil by the fowls.

For the simple improvement of poor land, the folding of 25 birds over one acre of land in a year has proved satisfactory, and it is important to note that, under this system of light stocking, wild white clover is encouraged, and not dis-

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couraged as it is under the intensive stocking of pens. The actual number of birds required, however, for the improvement of one acre of land will naturally vary inversely with the frequency it is desired to run poultry over the same land. Thus, if the land is to be treated once in four years, it would probably be sufficient to run 100 laying birds over one acre of land in the course of twelve months.

Acid land must be limed if the full benefit of the treatment with poultry is to be obtained, and, when poultry are repeatedly run over the land, dressings of potash must be periodically applied.

When poultry are to be housed in small portable folds, the birds should not be overcrowded, and the number should therefore not exceed 15 adult birds per unit measuring 20 ft. \times 5 ft. Even this number allows only slightly over two-thirds of a square yard per day. This means extra outlay on folds, but it would probably be offset by the lower mortality and better health of the birds. It would also mean that the birds must be moved twice or three times over the same land in twelve months to obtain sufficient manure on the land. This could be done without difficulty on light dry land.

Like the folding of pigs and the "bail" system of dairy farming, the folding of poultry has provided an excellent means of increasing the productivity of Down pastures. The value of this system on other types of light land, both pasture and arable, is now well recognized, but it may not be so well recognized that the manure from a large flock of poultry is a valuable source of nitrogen, which exists in a fairly quick-acting form. The manure from a large flock of laying birds would enable a considerable reduction to be effected in the expenditure on nitrogenous fertilizers applied to grass land to stimulate the growth of an early spring bite. Thus, a flock of 1,000 laying birds moved systematically over one acre of grass land in a fortnight would deposit manure equivalent to $2\frac{3}{4}$ cwt. sulphate of ammonia (as well as $2\frac{1}{4}$ cwt. superphosphate and 40 lb. sulphate of potash).

Two points concerning the nitrogen in poultry manure must be borne in mind. It is somewhat slower and steadier in action as compared with the nitrogen of sulphate of ammonia, and its efficiency is only about 70 per cent. of the latter. This value for the efficiency of nitrogen in poultry manure has been deduced from experiments recently conducted with this manure in the West of England and elsewhere.

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Finally, attention may be drawn to the need for information regarding the influence of poultry on the hay crop. It is a frequent custom to fold or run poultry during the winter months over land that is to be mown for hay. There appear to be no data published on the effect of this treatment on the subsequent yield, and such data are urgently required, since it is a matter of economic interest both to the specialist poultry farmer and to the general farmer.

In this brief survey an endeavour has been made to discuss the more important problems concerning the management of grass land in relation to poultry husbandry. Where possible, suggestions have been made, but these must be regarded as tentative pending investigations on a wider basis.

ACKNOWLEDGMENTS.—The collection of the samples of herbage from the County Egg-Laying Trials was carried out by Major Eden of the Ministry of Agriculture and the County Agricultural Organizers and their staffs. To them the writers' thanks are due.

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BEET SUGAR INDUSTRY IN GREAT BRITAIN: FINANCIAL POSITION OF THE FACTORY COMPANIES

THIS article reviews the financial position of the 15 beet sugar manufacturing companies as at March 31, 1936, and the trading results of the 18 factories operated by the companies in the 1935-36 campaign. The information given is supplementary to that contained in the "Report on the Sugar-Beet Industry at Home and Abroad,"* relative to the 1924-25 to 1929-30 campaigns, and in articles in the February, 1932, March, 1933, February, 1934, May, 1935 and March, 1936, issues of this JOURNAL, relative to the 1930-31, 1931-32, 1932-33, 1933-34 and 1934-35 campaigns respectively. As explained in an article in the May, 1936, issue of the JOURNAL (pages 141-145), the 15 factory companies have now been amalgamated into the British Sugar Corporation, Ltd., under the provisions of the Sugar Industry (Reorganization) Act, 1936, and this is accordingly the final article of the series dealing with the companies that are now being wound up. As regards the future, certain accounts of the British Sugar Corporation will be included in the annual reports of the Sugar Commission.

Table I (see Table 67 and Appendix H of the Sugar-Beet Report) summarizes the combined balance sheets of all the companies and shows their financial position as at March 31, 1936, together with comparable figures for the previous year. Reserves and credit balances on Profit and Loss Account amount to £1,591,737, of which £251,122 was appropriated for payment of dividends, equal to 5.5 per cent. on the total share capital. The large reduction in reserves and cash balances is attributable in the main to a distribution of £740,000 as cash bonus to shareholders subsequent to March 31, 1935. Pending completion of the winding-up arrangements, certain companies have not distributed any dividends in respect of the year, and the balance to be carried forward into liquidation amounts to £1,340,615. Dividend payments in the previous year amounted to £513,762, or 11.3 per cent., and in 1933-34 to £370,392, or 8.3 per cent.

* Economic Series No. 27: H.M. Stationery Office, 1931. (Out of print.)

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TABLE I.—SUMMARY OF BALANCE SHEETS OF BRITISH BEET SUGAR FACTORY COMPANIES AS AT MARCH 31, 1935 AND 1936

	As at March 31		Increase or Decrease
	1935	1936	
<i>Liabilities :</i>	£	£	£
Share Capital	4,550,954	4,550,954	—
Mortgages and Debentures	1,319,017	1,261,517	— 57,500
Bank and other Loans	453,848	783,142	+ 329,294
Sundry Creditors and Out- standings	1,187,445	960,203	— 227,242
Reserves*	1,557,483	762,918	— 794,565
Profit and Loss Balances before appropriation of Dividends less Deficits	907,207	828,819	— 78,388
Total Liabilities	9,975,954	9,147,553	— 828,401
<i>Assets :</i>			
Beet Sugar Factories & Equip- ment less Depreciation	5,113,757	5,214,695	+ 100,938
Investments	966,028	822,142	— 143,886
Stocks and Stores	1,784,860	1,885,972	+ 101,112
Sundry Debtors & Prepayments	760,674	627,169	— 133,505
Cash Balances	1,350,635	597,575	— 753,060
Total Assets	9,975,954	9,147,553	— 828,401

* Including capital reserves ; also a special reserve of £10,000 in 1935.

The position in regard to capital expenditure on factories and equipment to March 31, 1936, is as follows :—

	£	£
Total expenditure	9,369,916	
Less : Depreciation	4,001,933	
Written off on reconstruction ..	153,288	—
	4,155,221	
Balance as per Table I	5,214,695	

Investments amounted to £822,142 of which £667,138 was invested in associated companies, as compared with £966,028 and £777,350 in 1934-35, and £854,501 and £769,325 in 1933-34. The capital cost per ton of beet worked was £2.75 as against £2.25 in the 1934-35 campaign and £2.7 in 1933-34.

Table II (see Table 70 and Appendix F of the Sugar-Beet Report) has been compiled from data supplied by the factories, and shows, as compared with the previous year, the manu-

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TABLE II.—MANUFACTURING COSTS AND OVERHEAD CHARGES OF BRITISH BEET SUGAR FACTORIES FOR THE CAMPAIGN YEARS 1934-35 AND 1935-36. TOTAL AND PER TON OF BEET WORKED.

	1934-35		1935-36		Increase or Decrease per ton of beet
	Total	Per ton of beet	Total	Per ton of beet	
Coal and coke	£ 503,156	s. 2 5	£ 405,219	s. 2 5	—
Limestone	100,192	0 6	81,200	0 6	—
Bags	269,043	1 4	214,045	1 3	— 1
Other manufacturing supplies	112,268	0 6	97,175	0 7	+ 1
Repairs and maintenance	201,526	1 0	157,428	0 11	— 1
Salaries and wages ..	784,817	3 10	713,054	4 2	+ 4
Rates and insurance ..	54,381	0 3	56,771	0 4	+ 1
Other general charges ..	96,170	0 6	110,396	0 8	+ 2
Beet expenses	181,548	0 11	133,098	0 9	- 2
Total	£ 2,303,101	11 3	£ 1,968,386	11 7	+ 4

facturing costs and overhead charges under the main sub-heads of expenditure in total and per ton of beet worked. The total cost per ton of beet was 4d. more than in 1934-35 but 4d. less than in 1933-34.

Table III (see Table 91 and Appendices F & G of the Sugar-Beet Report) summarizes the trading and profit and loss accounts for the financial years ended March 31, 1936 (1935-36 campaign), and March 31, 1935 (1934-35 campaign). The total income from products in 1935-36, after deducting Excise Duties, but before crediting subsidy, was £6,753,648 or 39s. 8d. per ton of beet, as against £7,699,354 or 37s. 7d. in the previous year and £6,152,264 or 37s. 3d. in 1933-34. Under the Sugar Industry (Reorganization) Act, 1936, the sum of £2,218,147 in respect of subsidy for 1935-36 is due to be supplemented by allowances for interest on capital, not exceeding in the aggregate £315,000. These allowances accrue to the transferor companies, but as the exact amount had not been determined by March 31, 1936, it was impossible to include them in the profit and loss accounts for the year. The cost of sugar-beet, £6,609,412, represented 74 per cent. of the net total factory income from products including subsidy, an increase of 6 per cent. over each of the two previous years. The net profit on beet trading equalled 2s. 4d. per ton of beet worked and on subsidiary industries 1s. 3d. per ton, making

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TABLE III.—BRITISH BEET SUGAR FACTORY INCOME, EXPENDITURE AND PROFITS FOR THE YEARS ENDED MARCH 31, 1935 AND 1936. TOTAL OF ALL FACTORIES AND AVERAGES PER TON OF BEET WORKED.*

	Total		Per ton of beet	
	1934-35	1935-36	1934-35	1935-36
<i>Income, Expenditure and Profits:</i>	£	£	s. d.	s. d.
Net income from sugar (<i>less</i> Excise Duty)	6,358,985	5,560,060	31 1	32 9
Molasses	107,564	82,659	0 6	0 6
Pulp	1,231,576	1,100,373	6 0	6 5
Lime sludge	1,229	1,547	—	—
Total income from saleable products	7,699,354	6,753,648	37 7	39 8
Add Subsidy	4,599,488†	2,218,147	22 0	13 1
Total income	12,208,842	8,971,795	59 7	52 9
Less cost of beets	8,342,966	6,600,412	40 9	38 10
			(68%)	(74%)
Balance to factories	3,865,876	2,362,383	18 10	13 11
			(32%)	(26%)
Less manufacturing costs and overhead charges	2,303,104	1,968,386	11 3	11 7
Beet trading profit	1,562,772	393,997	7 7	2 4
Profit on subsidiary industries	117,487	219,410	0 7	1 3
Total profit	1,680,259	613,107	8 2	3 7
<i>Appropriations of Profits:</i>				
Interest charges (net)	32,525‡	42,878	0 2	0 3
Directors' Fees	36,749§	31,395	0 2	0 2
Depreciation and writing-down	354,978	85,399	1 0	0 6
Income Tax	236,003	57,655	1 2	0 4
Dividends	513,762	251,122	2 0	1 6
Reserved	281,657	4,000	1 4	—
Total Appropriations	1,455,764	472,359	7 1	2 9
Appropriations from Reserve	—	44,563	—	0 3
Unappropriated Balances || .. .. .	1,455,764	427,796	7 1	2 6
	224,495	185,611	1 1	1 1
	1,680,259	613,407	8 2	3 7

* The figures are based on the confidential trading and profit and loss accounts of all the companies.

† Including in 1934-35 £83,247 advances under the British Sugar Industry (Assistance) Act, 1931, brought into account. Of this sum £28,574 was not in fact brought into the profit and loss accounts, being

(Notes to Table III continued at top of next page)

BEET SUGAR INDUSTRY IN GREAT BRITAIN

applied direct to general reserves, but, for the sake of convenience in the preparation of the above table, this sum has been included in the total of £83,247 and also in the figure of £281,657 for Appropriations to Reserves.

† After deducting £35,000 profit on sale of investments.

§ Including £1,360 special Directors' Fees paid out of Profit and Loss balances.

|| Representing :—

		1934-35	1935-36
		<i>£</i>	<i>£</i>
Increase in credit balances ..	122,658	184,860	
Decreases in debit balances ..	101,837	751	
		224,495	185,611

a total net profit for the year's trading of 3s. 7d. per ton. In 1934-35, the corresponding figures are profits of 7s. 7d. and 7d., totalling 8s. 2d. per ton; and, in 1933-34, profits of 6s. 11d. and 6d. totalling 7s. 5d. per ton. The total profit in 1935-36 was, therefore, 4s. 7d. per ton lower than in 1934-35, and 3s. 10d. per ton lower than in 1933-34.

The appropriations of the profits from the year's trading amounted to £472,359, which, after taking into account £44,563 appropriated from reserves, left a balance of £185,611 to be carried forward. The figure of £85,399 for depreciation in 1935-36, which includes £23,399 written-off, is not comparable with the figure of £354,978 in respect of 1934-35, since, under the Sugar Industry (Reorganization) Act, 1936, a sum of £240,000 has been paid to the British Sugar Corporation, Ltd., in respect of depreciation in 1935-36, and full provision was accordingly not made by the transferor companies. As mentioned above, certain companies, in view of the pending winding-up, made no provision for dividend distribution, and for the same reason it was unnecessary to make any appropriations to reserve with the exception of special reserves unaffected by the amalgamation.

The quantity of beet worked at the factories in the 1935-36 campaign was 3,403,989 tons (washed and topped weight), and the duration of the campaign 98 days, comparing with 4,094,707 tons and 122 days in 1934-35, and 3,298,119 tons and 107 days in 1933-34. The average daily through-put of beet was 34,735 tons in 1935-36, 33,563 tons in 1934-35, and 30,824 tons in 1933-34. The production of sugar, expressed in terms of commercial white sugar as calculated in accordance with the provisions of the Sixth Schedule to the Sugar Industry (Reorganization) Act, 1936, was 471,704 tons against 593,189 tons in 1934-35 and 450,605 in 1933-34.

MARKETING NOTES

Milk Marketing Scheme. Pool prices and rates of producer-retailers' contributions for December, 1936, are given below, with comparative figures for November, 1936, and December, 1935. The wholesale liquid milk price was 1s. 5d. per gal. in each month.

Region	Pool Prices			Producer-Retailers' Contributions		
	Dec. 1936	Nov. 1936	Dec. 1935	Dec. 1936	Nov. 1936	Dec. 1935
	d.	d.	d.	d.	d.	d.
Northern ..	14	13½	13½	2½	3 16	3 14
North-Western ..	14	13½	13½	2½	3 16	3 16
Eastern ..	14 14	13½	14	2 16	2 7	2 11
East Midland ..	14 14	13½	13½	2 16	3 16	2 7
West Midland ..	14	13½	13½	2 5	3 1	3 1
North Wales ..	14	13½	13½	2 8	3 1	3 1
South Wales ..	14	13½	13½	2 8	3 16	3 16
Southern ..	14 14	14	14	2 1	2 16	2 11
Mid-Western ..	14	13½	13½	2 8	3 1	3 1
Far-Western ..	13½	13½	13	2 16	3 1	3 16
South Eastern ..	14 14	14 14	14 14	2 16	2 2	2 2
Unweighted Average ..	14·14	13·55	13·55	2·52	3·03	3·03

These prices are exclusive of any premiums for special services and level deliveries, and also of the accredited producers' premium of 1d. per gal.

The number of producers who qualified for the accredited premium was 20,080 and the sum required for the payment of the premium was equivalent to a levy of 350d. per gal. on pool sales.

The inter-regional compensation levy was fixed at 1½d. per gal., compared with 1¾d. per gal. in December, 1935. A levy of ¼d. per gal. was made for general expenses.

Sales on wholesale contracts were as follows:—

	Dec., 1936 (estimated)				Dec., 1935	
					Gal.	Gal.
Liquid	47,302,947	46,188,275
Manufacturing	16,310,319	20,063,149
					<hr/>	<hr/>
					63,613,266	66,251,424
Percentage liquid sales	74·36	69·72		
Percentage manufacturing sales	25·64	30·28			

MARKETING NOTES

The average realization price of manufacturing milk during December was 6·25d. per gal., compared with 6·17d. per gal. for December, 1935. The quantity of milk manufactured into cheese on farms was 428,146 gal., compared with 702,329 gal. in November, and 379,217 gal. in December, 1935.

Inquiry into Objections to Amendments. The public inquiry into objections to the amendments of the Milk Marketing Scheme, which was conducted by Mr. N. L. C. Macaskie, K.C., was concluded on January 11. The inquiry lasted for 29 days in all, of which 9 days were occupied by the hearing of the special case of the producers of tuberculin tested milk.

Pigs and Bacon Marketing Schemes. Following the cancellation of the pig contracts for 1937, the Pigs and Bacon Marketing Boards, and, subsequently, the Bacon Development Board, discussed the desirability of continuing some system of control over the marketing of bacon pigs. It is understood that proposals for the future organization of the industry and also for the arrangements to be adopted in the meantime are under examination.

Hops Marketing Scheme: Trading in the 1936 Crop. Valuation of the 1936 hop crop was delayed owing to weather conditions. Trading in the crop was, however, begun on January 6 (compared with January 15 last year). During the first 28 days of trading, hops may be offered and sold only to merchants nominated by brewers who have entered into a firm contract with the Hops Marketing Board. The Board have made further payments to growers of sums sufficient to make up, with previous payments, approximately two-thirds of the estimated valuation of their quota hops.

American Hops. In 1935, the American hops crop was considerably in excess of the home demand, and there was an export trade to this country at prices ranging from £8 to £10 per cwt. (duty of £4 per cwt. paid). These prices were below the cost of production, and a certain amount of grubbing took place. Climatic conditions for the 1936 crop were unfavourable, and the crop was abnormally small, but on the whole good in quality. In consequence, the prices of American hops during 1936 ranged from £15 10s. to £17 per cwt. (duty paid). Under the five-year agreement between the Hops Marketing Board and the Brewers' Society, the prices of English hops have remained at the agreed average of

MARKETING NOTES

£9 per cwt., and, during the past two years, production has not varied to any appreciable extent.

Wheat Act, 1932: *Sales of Home-grown Wheat, Cereal Year, 1936-37.* Certificates lodged with the Wheat Commission by registered growers during the period August 1, 1936, to January 8, 1937, cover sales of 11,734,687 cwt. of millable wheat as compared with 18,670,295 cwt. in the corresponding period (to January 10) in the last cereal year.

Appointment of Member of Wheat Commission. The Minister of Agriculture and Fisheries and the Secretaries of State for Scotland and the Home Department have appointed Mr. J. H. Pillman, of 11, Hart Street, Mark Lane, London, E.C.3, to be a member of the Wheat Commission representing the interests of importers of flour, vice Mr. F. T. Collins, deceased.

Milk Acts, 1934 and 1936 : Manufacturing Milk. Advances made by the Ministry up to January 15, 1937, in respect of manufacturing milk were as follows:—

Section of Act	Period of Manufacture	Quantity	Advances
	(a) <i>Milk Marketing Board for England and Wales.</i>		
1	In respect of Milk : Manufactured at factories other than the Board's	April, 1934, to Oct., 1936	Gallons £
			475,801,922 2,139,379
2	Manufactured by the Board ..	April, 1934, to Sept., 1935	2,573,662 12,850
3	Made into cheese on farms ..	April, 1934, to June, 1936	36,055,516 187,463
	* Total for England and Wales ..	514,431,100	2,339,692
	(b) <i>Government of Northern Ireland.</i>		
6	In respect of milk : Manufactured into cream and butter at registered creameries ..	April, 1934, to Sept., 1936	
		60,168,430	359,021
	TOTAL ..	574,599,530	2,698,713

* Owing to the Cheese-Milk Prices for August and September, 1936, being in excess of the Standard Price, no subsidy is payable in respect of milk sold for manufacture in these months.

Milk-in-Schools Scheme. The following table, which has been compiled from claims submitted by the Milk Board up

MARKETING NOTES

to January 15, 1937, shows the gallonage consumed and the corresponding Exchequer grants for each month during the first two years of the Scheme. Further returns will slightly increase the figures for the second year, but the increase is expected to be less than two per cent.

	1934-35		1935-36	
	Gallons	Payment	Gallons	Payment
October	1,972,077	41,050	2,273,153	52,090
November	2,448,779	50,977	1,951,474	44,720
December	1,771,961	40,568	1,562,675	35,808
January	2,174,789	49,779	1,901,097	43,562
February	2,347,678	53,733	2,050,748	46,990
March	2,388,657	49,688	2,303,877	52,772
April	1,648,874	34,261	1,545,931	32,172
May	2,246,518	27,843	2,140,537	26,691
June	1,585,814	16,639	1,797,910	22,190
July	1,833,392	13,369	1,766,683	16,788
August	449,887	3,280	469,141	3,421
September	1,983,923	20,666	2,084,995	19,547
	22,852,349	401,853	21,848,221	396,751

General Publicity. A further scheme submitted by the Milk Marketing Board on the recommendations of its Advisory Committee on Milk Publicity has been approved. It follows the lines of those conducted during 1935 and from February to November, 1936. Of the total estimated cost of £60,000, the major portion will be devoted to a Press and poster campaign covering the period November, 1936, to September, 1937. The Scheme was drawn up in consultation with the National Milk Publicity Council and its main activities will link up with the work of that Council, particularly as regards the "Milk in Industry Campaign," designed to encourage the consumption of milk in factories, workshops and offices.

Cheese-Milk Price. For the purpose of payments under the Milk Acts, 1934 and 1936 (whether by the Exchequer to Milk Marketing Boards or by Boards to the Exchequer), in respect of milk used for manufacture, the cheese-milk price has been certified by the Minister and the Secretary of State for Scotland to be 5*41* pence per lb. for the month of January, 1937.

Experimental Cheap Milk Schemes in the Special Areas: Jarrow. A scheme for the supply of milk at 2*d.* per pint to

MARKETING NOTES

expectant and nursing mothers and to children under school age was inaugurated at Jarrow on January 1. The scheme, which is similar to that operating in the Rhondda Valley (see below), has been made possible by the co-operation of the Milk Marketing Board, the Commissioner for the Special Areas, the Jarrow Borough Council, and the local milk distributors. As in the Rhondda Scheme, each consumer in the three categories is allowed a minimum of one pint per day at the reduced price. There is no means test of any kind and the milk is delivered to the consumer's house in pint bottles. Under the scheme, distributors accept a reduced margin of 8d. per gal. and the Milk Marketing Board and the Commissioner for the Special Areas each contribute half the amount necessary to enable the milk to be sold at the reduced price.

Rhondda. A note on this scheme appeared on page 575 of the issue of this JOURNAL for September, 1936. Recent returns show that on December 12, 1936, there were 4,386 persons, of whom more than 3,400 were children under school age, availing themselves of the facilities offered, while the total consumption of milk for the week ended on that date was 24,000 pints. Enquiries initiated by the Milk Board have shown that, prior to the inception of the scheme, the milk consumption in the families now benefiting under it was lower than the average consumption for the whole district. Thus, in 350 of the families concerned, no fresh milk was purchased in the week prior to the entry into the Scheme, while in 800 families the per capita consumption was less than one pint per person per week or one-seventh of a pint per day.

Sugar Industry (Reorganization) Act, 1936 : Production of Sugar from Home-grown Beet during 1936-37 Campaign. According to information furnished to the Ministry by the British Sugar Corporation, Ltd., the total quantities of beet sugar manufactured in Great Britain during December, 1936, and the corresponding month in 1935, were:—

		White Cwt.	Raw Cwt.	Total Cwt.
1936	.. .. ..	1,512,186	1,701,007	3,213,193
1935	.. .. ..	1,202,047	1,557,671	2,759,718

The total quantities of sugar produced to the end of

MARKETING NOTES

December in each of the two manufacturing campaigns were :—

	<i>White Cut.</i>	<i>Raw Cut.</i>	<i>Total Cut.</i>
Campaign, 1936-37 ..	4,647,203	4,558,873	9,206,076
" 1935-36 ..	3,987,995	4,889,822	8,877,817

Cattle Fund. The following table gives particulars of payments made under the Cattle Industry (Emergency Provisions) Acts, 1934 to 1936, and shows the numbers of animals marked on importation into Great Britain :—

	1936 April 1 to Dec. 31	1935 April 1 to Dec. 31	Sept. 1,* 1934, to Dec. 31, 1936
Payments	£2,946,416	£2,809,566	£8,843,729
Animals in respect of which payments were made ..	1,259,414	1,188,147	3,736,471
Average payment per animal	£2 6 10	£2 7 3	£2 7 4
Imported animals marked at Ports (Great Britain only)	444,643	347,366	1,187,795†

* Commencement of subsidy payments.

† As from August 6, 1934.

Fat Stock : Carcass Sale by Grade and Dead-Weight. During the past year 11,834 cattle, 35,709 sheep, and 9,440 pork pigs were dealt with under the Grade and Dead-Weight Scheme, as compared with 10,573 cattle, 27,669 sheep, and 7,262 pork pigs in 1935. All the centres under the Scheme were well supported.

The following table shows the grading of the carcasses dealt with in 1936 :—

	Carcass Grade			Rejected	Total
	Super *	I	II	III	
<i>Cattle :</i>					
Bullocks & heifers ..	52	3,003	6,472	952	127
Other classes ..	—	300	608	234	86
<i>Sheep :</i>					
Lambs	—	10,910	11,960	3,006	1,437
Other sheep	—	4,488	2,846	751	311
<i>Pigs :</i>					
Pork pigs & sows ..	—	4,969	3,738	628	105
					9,440

* This grade is for bullocks and heifers only.

MARKETING NOTES

It will be seen that 41·6 per cent. of the carcasses qualified for Grade I (including Super-grade), 45 per cent. for Grade II, and 9·8 per cent. for Grade III. Only 1·8 per cent. of the cattle, 4·9 per cent. of the sheep, and 1·1 per cent. of the pigs were rejected as ungradable under the Scheme. Up to May 1, 1936, all ungradable carcasses were sold on commission. With the object of eliminating commission sales as far as possible, the Conditions of Sale were altered on that date so as to provide that ungradable carcasses shall be sold at prices agreed with the purchaser by the Ministry's Head Grader, or failing agreement, shall be sold on commission. Since the date indicated 1,592 animals have been rejected, of which 1,501 were sold at agreed prices, and 91 on commission.

The Scheme was introduced in March, 1930, and the total stock dealt with to December 31, 1936, comprised 9,990 consignments consisting of 31,964 cattle, 101,454 sheep, and 18,217 pigs.

National Mark Beef. From October, 1929, when the Scheme was introduced, to December 31, 1936, over two million sides of beef were graded and marked with the National Mark. During the past year, the Mark was applied to 382,274 sides, of which 48·5 per cent. were "Select," 50·0 per cent. "Prime," and 1·5 per cent. "Good."

The number of sides marked in 1936 was 50 per cent. more than in 1930.

British Industries Fair. The Ministry is staging an exhibit of National Mark products at the British Industries Fair, which is to be held at Olympia from February 15 to 26. The display will include canned and bottled fruit and vegetables; fruit-juice syrups; honey, cider and perry; Cheshire, Cheddar, Stilton and other home-produced cheese; creamery butter; wheat flakes; and such fresh fruits and vegetables as are in season. Samples of various National Mark products will be on sale, and a full range of the Ministry's publications will be available at the stand.

AGRICULTURAL RETURNS OF ENGLAND AND WALES, 1936*

Produce of Crops

THE areas under barley, oats, mixed corn and peas, as returned in June, 1936, were greater than those returned for these crops in June, 1935, but acreages of other crops were smaller than in the previous year. The area under seeds hay was also below that in 1935, but meadow hay showed a slight increase in area.

With the exceptions of mixed corn, beans, and root crops, yields per acre were lower than in 1935. The estimated total production of barley, mixed corn, turnips and swedes and mangolds was greater than in 1935, but lower figures were recorded for wheat, oats, hay, and potatoes. The estimated production of wheat in 1936 was 15 per cent. below that of the previous year. Production of turnips and swedes showed an increase of over 21 per cent.

Only meadow hay and root crops, other than potatoes, showed in 1936 a higher yield per acre than the average for the previous ten years.

Corn Crops: Wheat. The area under wheat in 1936 was 1,704,469 acres, or 4 per cent. below that in 1935, and the estimated yield per acre was 16·2 cwt. compared with 18·3 cwt. in 1935. The result of these reductions was that the total production declined from 1,623,000 tons in 1935 to 1,378,000 tons in 1936, a reduction of 245,000 tons, or 15 per cent. In all English counties except Lancashire and those in the extreme north, yields were below those of the average for the preceding ten years. The yield of 16·2 cwt. per acre for the whole of England and Wales was 1·5 cwt. below the ten years average.

Barley. An increase of 27,279 acres occurred in the area devoted to this crop. The lower yield per acre, 16·2 cwt. compared with 16·6 cwt. in 1935, was more than offset by the increased area, and total production rose by 7,000 tons to 663,000 tons. The figure of 16·2 cwt. per acre for yield over the whole country was lower by 0·1 cwt. than the average for

* This return was published on January 1, 1937.

AGRICULTURAL RETURNS, 1936: PRODUCE OF CROPS

PRELIMINARY STATEMENT SHOWING THE ESTIMATED TOTAL PRODUCE AND YIELD PER ACRE OF THE CORN, HAY AND ROOT CROPS IN ENGLAND AND WALES IN 1936, WITH COMPARISONS FOR 1935, AND THE AVERAGE YIELD PER ACRE OF THE TEN YEARS 1926-1935.

Crops	Estimated Total Produce		Acreage		Estimated Yield per Acre		
	1936	1935	1936	1935	1936	1935	Average of the Ten years 1926-1935
	Thousands of Tons	Thousands of Tons	Acres	Acres	Cwt.	Cwt.	Cwt.
Wheat ..	1,378	1,023	1,704,460	1,772,284	16·2	18·3	17·7
Barley ..	603	656	818,924	791,645	16·2	16·6	16·3
Oats ..	1,080	1,138	1,419,695	1,418,356	15·2	16·0	15·8
Mixed Corn ..	75	71	96,994	93,320	15·4	15·3	15·7
Seeds Hay*	1,674	1,795	1,338,849	1,385,591	25·0	25·9	26·9
Meadow Hay†	4,733	4,842	4,668,812	4,642,704	20·3	20·9	19·7
Beans for Stock-feeding or Seed	93	93	121,174	133,334	15·3	13·9	16·4‡
Peas for Stock-feeding or Seed	31	31	45,822	42,406	13·4	14·8	14·8‡
Potatoes ..	2,814	2,870	456,569	462,796	6·2	6·2	6·4
Turnips and Swedes ..	5,579	4,590	447,968	493,255	12·5	9·3	11·7
Mangolds ..	4,085	4,567	245,250	249,866	19·1	18·3	18·7

* Hay from Clover, Sainfoin and Grasses under rotation.

† Hay from Permanent Grass.

‡ Peas and Beans harvested as Corn up to 1934

the preceding ten years, and in approximately two-thirds of the counties in England and Wales reduced yields were recorded. Cambridge, Hertford, and Glamorgan were noteworthy as showing yields estimated at more than 1 cwt. above the ten years average.

Oats. The total acreage under oats was slightly larger than that in 1935, 1,419,695 acres against 1,418,356 acres. The yield per acre, however, was estimated at 15·2 cwt. compared with 16 cwt. in 1935, and the total production consequently decreased by 58,000 tons to 1,080,000 tons, a reduction of 5 per cent. The figure of 15·2 cwt. was 0·6 cwt. below that of the average of the previous ten years, and all divisions of England and Wales except the North-Western showed declines from the average yields of the period 1926-35.

Mixed Corn. There was an increase in acreage from 93,320 in 1935 to 96,994 in 1936, and the yield per acre was estimated at 0·1 cwt. higher, at 15·4 cwt. The total production in England and Wales was estimated at 75,000 tons as against 71,000 tons in 1935, an increase of nearly 6 per cent.

AGRICULTURAL RETURNS, 1936: PRODUCE OF CROPS

Though larger than in 1935, the yield of 15·4 cwt. per acre was less by 0·3 cwt. than the average of the preceding ten years, all divisions, except the North Western and South Wales showing decreases.

Beans. The crop dealt with is that harvested for stock-feeding or for seed. The area in 1936 fell by 12,160 acres to 121,174 acres, but the estimated yield per acre rose from 13·9 cwt. to 15·3 cwt., and the total production remained the same at 93,000 tons.

Peas. As with beans, the figures for peas relate to the crop harvested for stockfeeding or for seed. The area under peas rose from 42,406 acres in 1935 to 45,822 acres in 1936, but the estimated yield per acre fell by 1·4 cwt. to 13·4 cwt., and the total production in England and Wales remained unchanged at 31,000 tons.

Hay. The rains in June were favourable to growth, but they continued during July and harvesting was much hampered. In many districts it was not completed by the end of August, and much of the crop was seriously damaged.

Seeds Hay. The area under clover, sainfoin, etc., for hay was returned in 1936 at 1,338,849 acres against 1,385,591 acres in 1935. This decline, coupled with a reduction of 0·9 cwt. in the yield per acre, resulted in a smaller total production. This was estimated at 1,674,000 tons, compared with 1,795,000 tons in 1935, a decrease of 7 per cent. The yield of 25·0 cwt. per acre was nearly 2 cwt. below the ten years average, and all divisions of England and Wales showed yields below average, although thirteen individual counties, including Suffolk and three around London, showed increases.

Meadow Hay. The acreage under permanent grass for hay in 1936 was 4,668,812 acres, or 26,108 acres more than in the previous year. The yield per acre, however, was estimated at 20·3 cwt. as against 20·9 cwt. in 1935, and the total production for the country decreased from 4,842,000 tons to 4,733,000 tons, a fall of just over 2 per cent. The yield per acre over the whole country was 0·6 cwt. in advance of the ten years average of 19·7 cwt. and the two Midland divisions were notable in showing yields in all counties above the ten-year averages.

Potatoes. The area devoted to potatoes showed a reduction in 1936 for the third year in succession, the acreage being returned at 456,569, as compared with 462,796 in 1935. The

AGRICULTURAL RETURNS, 1936: PRODUCE OF CROPS

estimated yield per acre at 6·2 tons showed no change from that of 1935, and the total production fell from 2,879,000 tons to 2,814,000 tons, a reduction of 2 per cent. As against the average yield per acre of the preceding ten years, the yield in 1936 showed a reduction of 0·2 tons.

The figures given above relate to seeds and chats as well as ware potatoes, and also include both first and second earlies as well as the main crop.

Roots : Turnips and Swedes. The area under these roots has shown a continued reduction in recent years, and the decline between 1935 and 1936 was from 493,255 to 447,968 acres. The estimated yield per acre, however, at 12·5 tons was exceptionally high and, despite the smaller acreage, the total production for England and Wales rose by 21 per cent. from 4,590,000 tons in 1935 to 5,579,000 tons in 1936. The yield per acre was above the ten years average figure by 0·8 tons per acre, and most divisions in England contributed to this increase. The Northern division, which comprises Northumberland, Durham and the North and West Ridings of Yorkshire, gave a yield nearly 2 tons per acre above the ten years average, but, with one exception, all the Welsh counties showed decreases.

Mangolds. Only 245,250 acres were returned as being under this crop in 1936, compared with 249,866 acres in 1935. The average yield per acre at 19·1 tons, however, was estimated at 0·8 tons higher than in the previous year, and the total production in England and Wales increased from 4,567,000 tons in 1935 to 4,685,000 tons in 1936. The yield of 19·1 tons per acre was 0·4 tons above the average of the ten years 1926-1935, and this improvement was, on the whole, general throughout England and Wales.

Sugar-Beet. The area under this crop was 348,147 acres compared with 366,698 acres in 1935. The average yield per acre of washed and topped beet is provisionally estimated at 9·4 tons, or 0·3 tons higher than in 1935.

Produce of Hops.* Preliminary statement showing the estimated total production of hops in the years 1936 and 1935, with the acreage and estimated average yield per statute acre in each county of England in which hops were grown; and the average yield per acre of the ten years 1926-35.

* This return was published on January 14, 1937.

AGRICULTURAL RETURNS, 1936: PRODUCE OF CROPS

Counties, etc.	Estimated Total Produce		Acreage returned in June		Estimated Average Yield per Acre			Average of the 10 years, 1926-1935
	1936	1935	1936	1935	1936	1935	1935	
Kent	East ..	Cwt. 34,000	Cwt. 35,500	Acres 1,990	Acres 2,051	Cwt. 17.1	Cwt. 17.3	Cwt. 14.8
	Mid ..	46,000	44,200	3,032	2,969	15.3	14.9	13.4
	Weald ..	70,200	66,600	5,084	5,122	13.8	13.0	12.2
	Total ..	150,800	146,300	10,106	10,142	14.9	14.4	13.1
Hants ..	..	7,100	7,100	550	573	12.7	12.4	11.6
Surrey ..	..	1,700	1,600	115	110	14.4	14.8	11.4
Sussex ..	..	24,200	19,800	1,586	1,462	15.2	13.5	12.8
Hereford ..	..	45,000	47,600	3,994	3,998	11.3	11.0	10.7
Worcester ..	..	22,300	25,000	1,804	1,901	11.8	13.1	10.2
Other Counties *	900	900	66	65	13.0	13.8	11.6	
TOTAL ..	252,000	248,300	18,317	18,251	13.7	13.6	12.3	

* Salop, Gloucester, and Berkshire.

The total acreage under hops returned in 1936 by occupiers of agricultural holdings exceeding one acre in extent was slightly larger than that of the previous year. Although some of the chief hop-producing counties showed decreases in acreage, these were more than balanced by increases of 63 acres in the Mid-Division of Kent and of 124 acres in Sussex. The total production is estimated at 252,000 cwt. or 3,700 cwt. more than in 1935, and is the same as the average for the ten years 1926-1935.

Hops grown by brewers for their own use, or sold by producers under registered contracts, do not come under the marketing provisions of the Hops Marketing Scheme. For this reason the quantity of hops consigned for sale to the Hops Marketing Board is less than the estimated total production of 252,000 cwt.

The yield per acre over the whole of the hop-growing areas is estimated to be 13.7 cwt. compared with 13.6 cwt. in 1935 and an average of 12.3 cwt. for the ten years 1926-1935. In Kent, which again returned more than half the total hop acreage, and nearly 60 per cent. of the total production, the yield per acre was estimated to be 14.9 cwt. as compared with 14.4 cwt. in 1935. In Sussex, which also showed the largest increase in acreage, the yield was estimated to be 15.2 cwt. per acre, compared with 13.5 cwt. in 1935 and a ten years' average of 12.8 cwt. Decreases in yield per acre and total

AGRICULTURAL RETURNS, 1936: PRODUCE OF CROPS

production were, however, recorded both in Hereford and Worcester.

The weather conditions during the earlier part of the growing season were somewhat unfavourable, but the weather which prevailed at the end of August was ideal for the crop, and though many cases of downy mildew were observed, the quality is reported to be generally good. The area left unpicked was estimated to be 1,122 acres as compared with 632 acres in the previous year.

FEBRUARY ON THE FARM

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FEBRUARY opens the spring season of tilling and sowing, and the weather at this time makes itself felt for the rest of the year. Wet weather, frost or snow, not only delays the planting of early potatoes, and the drilling of grain crops, but delays the preparation of the land for the bulk of the sowing, which takes place in March and April. The importance of favourable weather this month is fully realized in arable districts, such as in the S.E. of England, where many like to have all their grain drilled by Lady Day. Last year, the weather was very unfavourable during the month. In the early-potato districts of Scotland, for example, much of the planting had to be delayed until the middle of March, and it was said to be the most backward season since 1895; this was due, not to cold, but to the prolonged wet weather. In discussing the subject, it is not often realized how, even in a small country like Britain, very different weather conditions may prevail, for considerable periods in various portions of the country. A good example of this was encountered recently. Much rain and flooding were experienced in December in N. Wales; in Northumberland, on the other hand, especially towards the end of the month, farmers remarked about the phenomenon, unusual at that time of the year, of clouds of dust being seen above the country lanes.

Early Potatoes. With the price outlook distinctly favourable, growers of all kinds of potatoes face the coming season with unusual confidence. The area under potatoes in Great Britain has decreased by nearly 30,000 acres in the last three years. The greatest proportion of this decrease has fallen on the second earlies, which have been reduced by nearly 20,000 acres; the early varieties decreased by 7 per cent. From a national point of view this reduction is to be deplored, since potatoes are a very productive source of human food. In the statistics referred to above, it is interesting to observe how Arran Pilot increased from 850 acres in 1934 to nearly 4,200 last year, while Sharpe's

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Express decreased by over 4,000 to 8,140 acres. Eclipse, the early sort, grown in the greatest quantity, remained steady. Growers who do not buy seed of new varieties until it has reached the ordinary level of prices are watching with interest the progress of the much heralded Doon Early.

A correspondent in an agricultural journal recently called attention to the "twin row" method for planting potatoes described to him by an American grower. Two rows of sets are planted in one baulk, with distances of 12 in. between the tubers; the space between the twin rows is 33 in. and thus, two rows take only 45 in. This method would be inconvenient where ordinary digging machines are used, and also under our slower-growing conditions and methods of hoeing, but it has the merit that each row has the advantage of ample width on one side. In some parts of Cornwall where they "ring the changes" between early potatoes and broccoli, and where the crop has to be lifted as soon as possible, the tubers may be as little as 8 in. apart in rows 2 ft. apart; the degree of earliness of an "early" influences spacing in addition to size of sets, etc.

Drilling Grain. The rise in commodity prices has arrived too late to affect this year's proportion of arable land, though the amount of wheat may, perhaps, be increased by growing rather more spring wheat at the expense of the other grain crops. It may be too late to increase the area under this crop, but there is still time to increase yields. If possible, the seed should be bought from a source where the possibility of serious infection from Loose Smut is small, and the seed should be treated against Bunt. If there is danger of attack from birds, the use of tar, or of tar-like substances when pickling, may be helpful. Trials in the Irish Free State show that tar in reasonable amounts does not affect germination; pigeons did not consume the grain so treated provided there was an alternative source of food. (February, incidentally, is the month for organized pigeon-shoots.) The manuring of wheat is too widely discussed to need much comment. One may, however, call attention to a note of warning contained in the latest Rothamsted Report, to the extent that now that rotations are not so strictly observed and farmyard manure may be less readily obtainable, the manuring should be watched closely to ensure that dressings are given sufficient for full crops. The effectiveness of potash and phosphate

FEBRUARY ON THE FARM

depends much more on soil and season than that of nitrogen. In 1935, some very marked responses to potash were noted at Rothamsted, gains of 32 cwt. of wheat (grain) having been obtained for each 1 cwt. of potassic fertilizer; in that particular year, superphosphate was less effective than potash. Wheat grown in the rotation occupies the land when its fertility is at its highest, and, in the report quoted above, the question is raised as to whether nitrogenous dressings are necessary for wheat grown on land in good heart.

Beans, and to some extent barley, are drilled this month if weather permits. Spring beans, like wheat, should be put in as early as possible; aphid attacks are more serious in the late-sown crop. The advisability of sowing malting-barley early is much debated. The success of a February-sown barley from Hereford, when it won for its grower the Championship in the 1935 Brewers' Exhibition, gained many adherents to sowing this month; the grower, who drilled the seed in the third week in February, stated that he would have sown much earlier but for fear of starlings.

Weeds. It is difficult to eradicate charlock by the harrows when it has had several weeks to consolidate its position in the autumn-sown crops. Sharp-tooth harrows do much good when the charlock is in the rough-leaved stage, but it is not very effective later. It is then best dealt with by spraying. In chalk soils, such as are found in Wiltshire, this weed is very aggressive, and may even smother other weeds. It may be stated that wheat crops are difficult to judge this month, and many a crop that has just escaped being ploughed up has surprised the grower after the full effects of tillering have become visible.

The use, at this time of the year, of the disc cultivator on dock-infested land is sometimes said to cause trouble in the corn crops later on, this implement being blamed for cutting up the roots into several parts, each capable of becoming a live unit. On a farm managed by an acquaintance, a man had been employed for seven weeks pulling up docks in a 20-acre field of spring oats, following a ley that had been broken up with the disc; over 200 bags of small roots had been collected, and the field was still declared to be far from free. In discussing this point with a colleague, the farmer mentioned that he once saw a field that was practically a "pure culture of catmint"; the disc had been blamed for

FEBRUARY ON THE FARM

cutting up this weed into small pieces, each of which had survived.

Lucerne. Lucerne requires much winter cultivation, which should be brought to an end by the middle of this month because of the earliness at which it starts to grow. Experienced growers say that satisfactory plants can be maintained for seven years if adequate winter cultivation is practised. It is said that it is difficult to be too drastic, and that it is best to set about it as if one were attempting to destroy the crop. Horse hoes, cultivators, pitch-pole harrows, and even the plough, are resorted to. Weeds constitute the main enemy of this crop; these are destroyed in this manner, while the lucerne is scarcely affected. A grower near Leicester, whose land is evidently ideal for this crop, claims that lucerne should last much longer than seven years with efficient winter treatment, and that the best crop he ever had was from a plant in its thirteenth year. The acreage under this crop in England and Wales increased by 2,100 acres to 38,100 acres last year. Over a quarter of the country's acreage is grown in Essex, in some parts of which county the rainfall averages only 20 in.

Cattle. The supplies of fat cattle fall off considerably this month, due probably to a decrease in demand after the Christmas season. The Report of the Reorganization Commission for Fat Stock (1934) states that the total supplies of all meat, home produced and imported, in this month are distinctly lower than those in January or March; the fact that imported supplies are not increased to level-up this drop suggests a slack demand at this time. With home-fed and home-killed beef, the fall continues, reaching its lowest point in June, when it begins a steady ascent. The complaints heard this year about the difficulty of maintaining milk supplies are not paralleled with fattening cattle; hay forms a greater proportion of the ration of dairy cows than of fattening beasts, and a wet harvest is reflected more in the supplies of milk than of beef.

There is some speculation as to the numbers of warbles that will appear this year—an index of the efficacy of the compulsory measures introduced last year. Owing to the lateness of the season last year, swellings are not likely to appear before the end of this month; after an early and dry

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summer, these lumps on the backs may appear as early as the middle of January.

Many milk producers at this time of the year suffer from complaints by customers about the colour of the milk. The cow can store vitamin A, or its parent substance, carotene, which gives to milk its rich colour; at this time of the year, the supplies stored by animals begin to get exhausted, and milch cows give milk of a poor colour unless green food or some type of silage or dried grass is fed. In recent research, carried out by Meeson in the U.S.A. and by S. J. Watson in Britain, the interesting fact is revealed that though the milk of some breeds has a deeper colour than that of others, the vitamin A potency need be no greater. With cows of the Guernsey and Ayrshire breeds, for example, receiving equal amounts of carotene, the former would give milk of a much deeper colour and with more carotene; the Ayrshire milk, however, while being less deeply coloured and having less carotene, would contain more vitamin A than the milk of Guernseys. Breeds differ in their capacity for converting the carotene in their diet into vitamin A. It may be mentioned that goat's milk, which is white in colour, is as potent in vitamin A as that of cows getting the same carotene-rich winter diet.

Another difficulty, a deficiency in solids-not-fat, is sometimes encountered by milk producers at this time of the year; it is not so usual as low fat content, but is more difficult to correct. In an instance investigated by the Midland Agricultural College, a gradual fall in the non-fatty solids occurred from February to March, followed by a rise from May to June; after another down-and-up movement, the proportion of these constituents settled to a steady level from November to February. Lynn, writing in *The Farmer and Stockbreeder* (August 31, 1936) states that these deficiencies, occurring towards the end of winter, improve as spring approaches. Experimental work indicates that rations cannot influence milk in this respect, but the fact that the difficulty often disappears when the cows are put on grass shows that feeding is not unconnected with the matter.

Sheep. Ewes and lambs are, this month, one of the most popular subjects for photographs in the agricultural and in the daily Press. At the time of writing, a wet, late autumn and early winter is said to have done no good to ewe flocks

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although good supplies of grass may have helped to make up for this; such weather has not been general, and flockowners in the north-west of England assert that the conditions have been so favourable that hand feeding was, in many flocks, unnecessary until the end of the year. Even allowing for the reputation of "never grumbling," possessed by the farmer in those parts, the flocks can be said to have, so far, wintered unusually well.

February is an anxious month where the bulk of the flock lambs at this time. In-lamb-ewe-disease, or pregnancy toxæmia, is at its worst in the first three weeks of this month. The disease may take various forms, and is known by different names; in the most common form the ewes are affected before lambing, and appear "silly"; the disease is, for this reason, sometimes mistaken for gid. In north Yorkshire, however, the disease affects the ewes about three weeks after lambing. The disease takes heavy toll if, as in 1936, the ewes approach the lambing season reduced in condition after having been in good condition the previous autumn. The affected ewes are generally those bearing twins, and, if the ewe survives, the lambs are dead. Though the affected ewes do not appear to be fat, they will be found, on being opened, to contain an excessive amount of fat around the bowels. The only effective preventive is to take the flock for a brisk walk of at least a mile each day as soon as the presence of the disease is suspected; this remedy was practised at least a generation ago. Walking the flock around the field is ineffective; the sheep must be taken a direct walk, such as along the road, where the affected and sluggish ewes will not get a chance of taking an inside position.

NOTES ON MANURING

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Manuring Barley. Manures can usually do little to improve the quality of malting barley, and any attempt to progress from the production of feeding barley to malting barley merely by the adoption of some particular scheme of manuring, is usually doomed to failure. The skill and care necessary in all the operations concerned with the production of a good malting sample are reminiscent of the art of cultivation as practised in years gone by, when the excellence of a seedbed was considered of more importance than its cost.

Nevertheless, as most farmers who have tackled the job will agree, the manuring of barley grown for malting purposes must be very carefully considered. As already indicated, on land in reasonably good "heart," artificial fertilizers can do little to *improve* the quality of the barley grain. In what direction then can manuring be expected to exert any important influence on the barley crop? The answer to this question is (1) that the supply of available plant food is an important factor in determining yield, and (2) that, though manuring can do little to improve quality, haphazard manuring may easily ruin the sample from the maltsters' standpoint. In general, therefore, manurial treatment should aim at producing the maximum crop that can be grown without lowering the standard of quality imposed by natural conditions such as soil and climate.

After correcting any serious lime deficiency—a necessary preliminary to the production of a good crop of barley of any description—there remain for consideration three important elements of plant food, and of these phosphorus and potassium, provided they are supplied in reasonable amounts to other crops in the rotation, are not likely to prove very serious factors except under conditions to be mentioned later. This fact was clearly established by the ten years' trials carried out by the Institute of Brewing and Rothamsted Experimental Station.¹ Nitrogen, however, usually represents the key to the manuring of malting barley. Unfortunately,

¹ *Journal of the Institute of Brewing*, Vol. XXXIX, No. 7.

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it is a key that is difficult to manipulate, owing to the many uncontrollable agencies that cause fluctuations in the supply of nitrogen present in the soil in a form in which it can be utilized by the growing plant.

Not only soil type, but previous cropping and manuring will also obviously affect the quantity of available nitrogen in the soil. Yet barley may follow roots folded on the land, roots carted off, a pulse crop or another cereal crop. The amount of nitrogen left for the barley crop will also vary in each of these instances, in accordance with the treatment of the individual crop, e.g., the roots may or may not have received a dressing of dung, and they may have been folded early or late in the season. Despite the obvious difficulties of assessing the nitrogen status of the soil, however, the importance of careful consideration of this point cannot be disregarded. That nitrogen, whether arising from organic residues in the soil or applied as manure or fertilizer, affects the nitrogen content of the grain, is illustrated by the following table taken from the Report of the ten-year trials referred to above:—

TABLE 1

Sulphate of ammonia per acre	None	1 cwt.	2 cwt.	3 cwt.	4 cwt.
Nitrogen per cent. in grain	1·37	1·34	1·50	1·56	1·71
Yield of grain per acre (bush.)	27·2	37·8	36·4	41·4	46·0

In general, samples of barley with a nitrogen content exceeding about 1·5 per cent. are not regarded as suitable for malting purposes. Although there is not always a close correspondence between the nitrogen content and the valuation of samples representing different varieties grown under widely different soil and climatic conditions, it is rare for a sample with much more than 1·5 per cent. of nitrogen to be valued at a good malting price. That very close correspondence may sometimes exist between valuation and nitrogen content for a single variety, is illustrated by the following table relating to Norfolk-grown samples of Spratt Archer sent to the Rothamsted Barley Conference held in the autumn of 1935.²

TABLE 2

Grade	I	II	III	IV	V	VI	VII
Per cent. nitrogen in dry grain	1·28	1·33	1·41	1·42	1·45	1·53	1·53

² *Rothamsted Annual Report, 1935, p. 31.*

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Table I also shows that, under the conditions of that experiment, the application of only 1 cwt. per acre of sulphate of ammonia produced a negligible effect on the nitrogen content of the barley grain, and it was only when heavier dressings were used that a serious increase in nitrogen content was brought about. Other experiments have confirmed this fact, and it seems reasonable to believe that, whilst even small dressings of nitrogenous fertilizer may be harmful to quality on a soil already rich in reserves of nitrogen, e.g., after roots heavily sheeped, most barley land in a normal state of fertility may receive up to, but not more than, 1 cwt. per acre of sulphate of ammonia without fear of seriously increasing the nitrogen content of the grain.

There is, however, one further point to bear in mind in connexion with the application of nitrogenous fertilizer, and that is the question of lodging. On fields where conditions are such that no objection can be raised on other grounds to a dressing of 1 cwt. per acre of nitrogenous fertilizer, the final decision must rest on whether that amount is likely to cause lodging. If there is no danger of this, there is little doubt that, in the majority of instances, such a dressing will be profitable, for in the ten years' experiments¹ it gave, on the average, an additional 5-6 bushels of grain per acre.

Experiments on the relative merits of different types of nitrogenous fertilizer have disclosed nothing to suggest that any one of the common types is superior to the others, provided that one compares quantities that supply the same amount of nitrogen. Hence the choice can be made for each farm solely on the grounds of price and convenience.

Unless adequate amounts of phosphate have been used for the preceding crop, it is always wise to include up to 3 cwt. per acre of superphosphate for the barley crop. Such a dressing has paid for itself on many occasions, particularly in Norfolk, and the classical long-term experiments on Hoosfield at Rothamsted also show an increase in yield from the use of phosphate. Though the soil on Hoosfield is admittedly at a low level of fertility, it is nevertheless interesting to note that phosphate and potash, used together, counteracted to some extent the harmful effect of nitrogenous fertilizer. On the average of a period of years nitrogenous fertilizer, used alone, raised the nitrogen content of the grain by 0·2 per cent., but the addition of phosphate and potash reduced this by 0·12 per cent.

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The position with regard to potash is slightly different, for it has rarely proved profitable except on light soils, where it is usually worth including. The issue, however, is further complicated by the fact that potash may, in some circumstances, bring about an altogether undesirable luxuriance in the development of undersown clovers—undesirable at any rate from the standpoint of the barley. Here again, then, caution is necessary.

When barley is grown as a second white straw crop there is little doubt that a complete fertilizer mixture including nitrogen, phosphate and potash is desirable. A suitable application on many farms would be superphosphate 3 cwt. per acre, sulphate of ammonia 1 cwt. per acre and muriate of potash $\frac{1}{2}$ to 1 cwt. per acre according to the soil type.

As regards the spring treatment of *autumn-sown* barley, this crop can usually be relied on to give a profitable response to a spring top-dressing of 1 to $1\frac{1}{2}$ cwt. of sulphate of ammonia if it received no autumn application of nitrogenous manure, the heavier application being suitable when the crop follows another cereal. Such a top-dressing will not usually injure the quality of autumn-sown barley.

Green Peas. As with almost all market garden crops, very few reliable manuring experiments have been carried out on green peas. Experiments are now in progress on several vegetable crops in various parts of the country, but some time must elapse before there is even as much information available as there is for many of the common agricultural crops. Experimental results relating to vegetable crops are, therefore, very welcome, and though they must be examined with caution when their numbers are so few, they will often serve as a useful guide both to growers and experimenters. The Rothamsted Report for 1935 gives a brief account of experiments on the manuring of a number of vegetable crops; these experiments have been carried out as opportunity occurred, since the year 1931. Many of the trials were on brussels sprouts, and in some instances the chief aim of the experiment was to test the merits of dried poultry manure. During the period 1933 to 1935, however, 5 experiments were carried out on peas for picking green.

Most growers nowadays will admit that phosphate and potash are important for this crop, and, unless the land has recently received liberal treatment with these two plant foods,

NOTES ON MANURING

it is a wise precaution to apply 3 to 5 cwt. per acre of super-phosphate or high-soluble basic slag, and the equivalent of about 2 cwt. of sulphate of potash.

The question of nitrogen, however, has proved much more controversial—some growers hold that the root nodules of leguminous crops make applications of nitrogenous fertilizer unnecessary, whilst others state that they have obtained appreciable benefit from dressings such as 1 to 2 cwt. per acre of nitro-chalk—sometimes applied to the seedbed and at others as a top-dressing even as late as when the crop is just coming into flower, where such a practice is possible.

Of the five Rothamsted experiments on peas, two gave significant responses to sulphate of ammonia at approximately 1½ cwt. per acre, whilst in the others nitrogen appeared to reduce the yield. Though these results seem at first sight to be somewhat contradictory, it is worth noting that the largest reductions in yield were obtained at centres where the mean yield was relatively high. It is probable, therefore, that, on land in really good heart, e.g., where peas follow a heavily-dunged crop, additional nitrogenous fertilizer is unnecessary. On soil in poorer condition, however, it seems likely that a dressing of from 1-2 cwt. per acre of a nitrogenous fertilizer will prove beneficial, though when using nitrogen care must be taken to avoid the production of too rank growth.

Winter Grazing and Early Bite. The production of winter grazing is important to many stock keepers who have stock to winter outdoors. Both Woodman at Cambridge, and Thomas at Armstrong College, however, have drawn attention to the extremely small quantity of herbage actually *grown* during the winter months, i.e., from October onwards. This is rather contrary to the older view that, by suitable manuring early in October, good grazing could be obtained in January. Though such a practice might be successful in the south, Woodman suggests that in East Anglia the end of July is the latest time at which summer grazing must be discontinued if an adequate amount of herbage is to be produced for grazing during the winter months, and this date would also probably not be too early in the north. Given a well-balanced sward, the amount of winter grazing is more dependent on the date when summer grazing is discontinued than on manuring policy.

It is generally possible, however, to encourage early growth

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of herbage in the spring by the use of appropriate fertilizers, provided weather conditions are favourable. An application of 1 to 1½ cwt. per acre of a quick-acting nitrogenous fertilizer in late February or early March, according to the locality, will usually encourage growth sufficiently for grazing to commence about a fortnight earlier than would otherwise be possible. For this purpose one should choose a sheltered field that has not been grazed since early autumn. The same field should not be used every year, however, or the balance of species in the sward will be upset, and the herbage plants that do *not* contribute very largely to the early bite will be favoured at the expense of those that do, and in consequence the amount and earliness of the "early bite" will decrease year by year.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton (2,240 lb.) during week ended Jan. 13					Cost per Unit ¶
	Bristol	Hull	L'pool	London		
Nitrate of Soda (N. 15½%) ..	£ 7 12d	£ 7 12d	£ 7 12d	£ 7 12d	9 10	
" " Granulated (N. 16%) ..	7 12d	7 12d	7 12d	7 12d	9 6	
Nitrate of Lime (N. 13%) ..	7 od	7 od	7 od	7 od	10 9	
Nitro-Chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4	
Sulphate of Ammonia :—						
Neutral (N. 20·6%)	7 2d	7 2d	7 2d	7 2d	6 11	
Calcium Cyanamide (N. 20·6%)	7 1e	7 1e	7 1e	7 1e	6 10	
Kainite (Pot. 14%)	2 18	2 15	2 15	2 15	3 IX	
Potash Salts (Pot. 30%) ..	5 0	4 17	4 15	4 17	3 3	
" " (Pot. 20%) ..	3 15	3 12	3 12	3 12	3 7	
Muriate of Potash (Pot. 50%) ..	8 3	8 1	7 17	8 1	3 3	
Sulphate " (Pot. 48%) ..	9 15	9 13	9 9	9 13	4 0	
Basic Slag (P.A. 15½%) ..	2 10c	2 0c	..	2 6c	2 II	
" " (P.A. 14%) ..	2 6c	1 10c	1 10c	2 3c	3 I	
Grd. Rock Phosphate (P.A. 20— 27½%)	2 10a	2 5a	2 10a	2 5a	1 8	
Superphosphate (S.P.A. 16%) ..	3 2	..	3 3f	3 0g	3 9	
" (S.P.A. 13½%) ..	2 18	2 17	2 19f	2 10g	4 1	
Bone Meal (N. 31%. P.A. 20½%) ..	..	6 10	6 10h	6 15	..	
Steamed Bone Flour (N. 1%, P.A. 27½—29½%) .. ..	..	5 10	5 0h	5 0	..	

Abbreviations : N.=Nitrogen ; P.A.=Phosphoric Acid ;
S.P.A.=Soluble Phosphoric Acid ; Pot.=Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station unless otherwise stated. Unit values are calculated on carriage-paid prices.

§ Prices are for not less than 2-ton lots, nett cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. prices

a Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater ; at Hull and Liverpool, f.o.r. neighbouring works, and at London, f.o.r. depots in London district. Fineness 80% through standard sieve.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra ; for lots of 2 tons and under 4 tons, 5s. per ton extra ; and for lots of 1 ton and under 2 tons, 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons, the price is 5s. per ton extra : for lots of 1 ton and under 2 tons, 10s. per ton extra : for lots of 10 cwt. and under 1 ton, 15s. extra ; and for lots of less than 10 cwt. but not less than 2 cwt. 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails ; southern rails 1s. 3d. extra.

h Prices shown are f.o.r. Appley Bridge.

¶ These are calculated by regarding a ton as comprising 100 " units " (equal parts of 22·4 lb.) so that a fertilizer, for example, with 16 per cent. nitrogen, contains 16 such " units " in a ton. Then, if the price per ton of such a fertilizer be divided by the percentage figure, the deduced cost is that of a " unit " of that agent. Those in the table above are based on London prices. (For further explanation, see Advisory Leaflet No. 146, "The Valuation of Artificial Manures," obtainable from the Ministry, free of charge.)

NOTES ON FEEDING

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Restricted Rationing of Pigs. The introduction of the principle of variable payments according to quality and weight classification under the Pigs Marketing Scheme has led to the development of widespread interest in the problem of how best to use the pig's food supply to combine the production of Grade A quality with optimum financial returns.

Before the last year or two, experimental work on pig feeding was largely devoted to comparisons of the effects of different rations upon growth-rates, with little reference to the quality of the product beyond a rough grading by inspection into good, medium, and poor-quality carcasses. Since all carcasses were commonly paid for at the same rate there was clearly little practical incentive to pursue the problem of quality any further.

Feeding "standards" applicable to such conditions have been arrived at from this past experimental work, these indicating in terms of starch equivalent, protein, and minerals the needs of the average pig at various stages of growth and fattening if it is to do its best in terms of rate of live-weight increase. The amounts of food specified in these "standards" approximate to the amounts that the slop-fed pig will clean up when fed two or three times daily.

Grading experience under the Scheme has created a growing opinion that this level of supply, whilst giving the desired rapid increase of live-weight, tends in too many instances to produce excessive fat on the back of the pig, and consequent inferior grading quality. It does not necessarily follow that the financial return to the feeder will be any the worse, but clearly the point as to whether, by some reduction in the feeding scale, the desirable higher quality may be obtained without financial sacrifice, or possibly even with financial advantage, needs to be investigated.

The problem is by no means simple, since many other variable factors enter into it, such as the breed and strain of the pig used, housing conditions, and general efficiency of management. The results of an individual test can thus

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only be accepted as valid for the particular combination of circumstances in which it was carried out. General guidance for the industry as a whole can only be arrived at when data are available from a sufficiently large number of such individual records to give a fair sample of the varying conditions in the industry. This limitation must always be kept in mind in applying the conclusions arrived at under the controlled conditions of experimental work to the variable conditions of practice.

That the rate at which food is supplied may have a marked effect both upon economy of production and carcass quality, when the conditions are carefully controlled by feeding each pig individually, has been clearly demonstrated in American experiments, and also in the more recent experiments of Mansfield at Cambridge. In the latter, restriction of food-supply commenced as each pig reached 65 lb. live-weight, the degree of restriction amounting at first (65-100 lb. l.w.) to one-quarter and later to one-third of the amounts consumed by similar pigs that were given as much of the same food as they would clear up at two daily feeds of half-an-hour each. Despite this considerable restriction of food-supply, and the consequent prolongation of their fattening period by an average of $27\frac{1}{4}$ days, the "restricted pigs" showed a substantial advantage in economic returns, which was associated with a marked improvement in carcass grading quality.

Further work along these lines is now desirable in order to ascertain the optimum point in the development of the pig at which restriction should commence, and the degree of restriction from that point onwards that will produce the best results.

Further, before the results of work carried out by methods of individual feeding can be applied to practice it is necessary that their applicability to group-feeding methods should be tested. In practice, pigs are always fed in groups, and any restriction of the amount of food placed in the common trough, below that which enables each pig to get his fill at feeding time, must mean almost inevitably that the stronger and more voracious pigs will be "full-fed" all the time, whilst their weaker sty-mates will go short in varying degrees. The practical problem is thus to ascertain how best to regulate the quantity of food so as to ensure optimum results in quality and financial return from the pen as a whole.

Practical experience under the grading schemes is steadily

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leading to the general acceptance of the view that, for good back-fat grading, some restriction of food supply is desirable, at any rate in the last few weeks of the feeding period, and there is a tendency to fix a maximum for the daily supply of meal at 5-6 lb.

The few experiments on which reports are now available also in the main confirm this conclusion as applied to restriction over longer periods. The experiments at Wye recently reported in this JOURNAL (this Vol., p. 235) may be quoted in this connexion. In these experiments the restriction started when the pigs were approximately 100 lb. live-weight and receiving 4½ lb. of meal per head daily, after which the "restricted pigs" received about one-sixth less food than the corresponding pigs in the unrestricted lots. In the section composed of Large White \times Large Black pigs the effects of the restriction were definitely favourable both in back-fat grading and financial returns, but, in the other section, composed of Large White \times Essex Saddlebacks, the improvement in quality effected was much less marked and of doubtful economy in view of the fact that the restricted pigs required about 14 days longer to reach 200 lb. live-weight.

In Scottish feeding trials with Large White pigs the superiority of ordinary rationing, up to a maximum of 6 lb. daily, over *ad lib.* feeding, has once more been demonstrated, both as regards economy and quality of product, but a reduction of 25 per cent. in the rate of increase of the food supply below that commonly used proved definitely uneconomic.

At Reading similar tests have been made with Large White and Large White \times Middle White pigs. In the first test, in which the "control lot" was rationed in accordance with Wood's standards, whilst the other lot received 10 per cent. less, there did not appear to be any advantage from the restriction. In the second test, in which both lots were fed according to Wood's standards until the daily consumption reached 4½ lb. per head, after which the daily ration of the "experimental lot" was kept at this level, the results were definitely adverse to restriction.

Whilst there appears to be good evidence, therefore, as to the desirability of some restriction of food supply at some stage of the feeding period, we are still much in the dark as to when and to what extent restriction should be introduced. A preliminary exploration of these two points has been made in a series of comparisons carried out at the Harper Adams

NOTES ON FEEDING

Pig-Feeding Experimental Station during last year. A summary of the results of these comparisons may serve to point the moral of the complexity of the problem and the danger of hasty generalizations from small-scale tests.

For the purpose of these comparisons 90 Large White pigs, all sired by the same boar, were used, these being divided into 18 pens of five pigs each, thus providing nine comparable pairs of pens. Eight of these pairs were used for duplicate comparisons of four "treatments," and the ninth for a single comparison of a fifth treatment. In each pair the pigs were drawn from as few litters as possible, and, in other ways, allotted with great care to secure comparability. During the test, trouble with pneumonia compelled the removal of a number of pigs from the experimental pens, eventually leaving a total of eighty available.

The general scheme of the test is shown below:—

<i>Pens</i>	<i>No. of Pigs</i>	<i>Feeding Treatment</i>				
{ A 1, A 2	.. 5, 5	..	" Full fed "	(at 2 meals daily).		
{ B 1, B 2	.. 5, 5	..	Restricted 20%	after 65 lb. liveweight.		
{ C 1, C 2	.. 5, 5	..	" Full fed."			
{ D 1, D 2	.. 5, 4	..	Restricted 20%	,, 85 lb.	,,	
{ E 1, E 2	.. 4, 4	..	" Full fed."			
{ F 1, F 2	.. 4, 3	..	Restricted 15%	,, 85 lb.	,,	
{ G 1, G 2	.. 4, 4	..	" Full fed."			
{ H 1, H 2	.. 5, 4	..	Restricted 10%	,, 85 lb.	,,	
{ I	.. 5	..	" Full fed."			
{ J	.. 4	..	Restricted 20%	,, 100 lb.	,,	

The maximum amount of meal given daily per head in the "full-fed" lots varied from 6 lb. to 8 lb., but in most instances did not exceed 6½ lb. Full details of the records of each pen will be given in the final report on these tests when issued, but for our present purpose the appended summary (Table, p. 1103) of the data for the combined pairs of pens will suffice:—

The pigs were marketed in three consignments, the first being despatched after 20 weeks' feeding, the second after 23 weeks, and the third after 25 weeks. The average weight at the time of consignment was 208 lb., but the weights of individual pigs varied from 190 lb. to 244 lb. The carcasses thus fell into two weight-classes for grading and payment, but to avoid complications no discrimination has been made in the data shown in the table. The belly gradings are not shown, since with very few exceptions these were all returned

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Treatment Group	I		II		III		IV		V	
	A ₁ , A ₂	B ₁ , B ₂	C ₁ , C ₂	D ₁ , D ₂	E ₁ , E ₂	F ₁ , F ₂	G ₁ , G ₂	H ₁ , H ₂	I	J
Pens	10	10	9	8	7	8	9	5	4
No. of Pigs .. .. .. .. ..	.. .. .. .. ..	F R(65 lb 20%)	F R(65 lb 20%)	F R(85 lb 15%)	F R(85 lb 15%)	F R(85 lb 10%)	F R(85 lb 10%)	F R(85 lb 10%)	F R(100 lb 20%)	F R(100 lb 20%)
Feeding Scheme* .. .. .. .. ..	.. .. .. .. ..	.. .. .. .. ..	.. .. .. .. ..	.. .. .. .. ..	.. .. .. .. ..	.. .. .. .. ..	.. .. .. .. ..	.. .. .. .. ..	.. .. .. .. ..	.. .. .. .. ..
Av. Initial L.Wt., lb	49.6	50.1	46.2	45.7	43.3	44.1	42.4	43.7	39.9	34.0
Av. days fed	146.7	153.7	151.6	150.7	149.5	147.0	149.5	153.0	168.4	170.5
Av. daily L.W.G., lb.	1.12	0.99	1.07	1.06	1.14	1.10	1.12	1.07	0.98	1.07
Av. meal eaten, lb.	625	538	659	548	602	540	644	590	726	621
Av. meal per lb. L.W.I., lb.	3.81	3.52	4.05	3.42	3.55	3.34	3.86	3.61	4.04	3.72
Av. carcass %	74.0	74.0	74.5	73.3	75.0	72.9	73.6	74.0	73.1	73.7
Back Grading %, A	10	80	40	44	37 ¹	29	12 ¹	44	—	67
" " B	50	10	30	22	12 ¹	57	37 ¹	22	80	—
" " C	40	10	20	22	37 ¹	14	37 ¹	33	20	33
" " D	—	—	—	—	10	11	12 ¹	—	—	—
Av. gross ret. per pig	4.16	4.15	4.16	4.16	4.13	4.17	4.11	4.13	4.14	4.12
Av. cost of meal per pig	1.17	1.17	1.12	1.12	1.19	1.13	1.16	1.18	1.15	1.17
Av. surplus return over meal cost per pig	2.19	3.3	2.16	6	3.0	3.0	2.18	2.14	2.18	2.14
Av. margin in favour (+) of restriction	—	+ 4.0	—	+ 4.5	+ 4.5	+ 2.1	—	+ 3.8	—	+ 2.3

* F = Full-fed. R = Restricted.

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as "A" grade, thus confirming experience elsewhere that the major difficulty is that of avoiding excessive thickness of back-fat.

A detailed examination of the results cannot be undertaken here, and no great stress can be placed upon the quantitative differences recorded, in view of the small numbers of pigs in each comparison (notably Lots I and J), but a brief comment may be made on a few features of general interest.

Duration of Feeding. It is rather surprising to find that on the average the restricted lots required practically no longer to reach baconer weights than the full-fed lots. The latter as a whole (41 pigs) required an average of 151·6 days and the former (39 pigs) 153·4 days, a difference of only two days. This is supported by the fact that the first consignment of 33 pigs sent to the factory after 20 weeks' feeding contained nearly as many pigs (14) from the restricted lots as from the full-fed lots.

Food Consumption. From the foregoing it follows inevitably that in every instance the average food consumption for the whole period was appreciably less for the restricted lots than for the full-fed lots, the differences per pig ranging from 54 lb. (Treatment IV) to 111 lb. (Treatment II). The efficiency of utilization of the food, as measured by lb. of meal required to produce 1 lb. of live-weight increase is also seen to be invariably superior in the restricted groups.

Grading. For convenience of comparison, in view of the varying numbers of pigs per lot, the grading returns have been given in the table as percentages. The comparison of full-fed and restricted pairs of lots under the different treatments shows considerable irregularities, with on balance an advantage in favour of restriction, especially if the A and B percentages are combined. The most striking difference is under Treatment I (20 per cent. at 65 lb.), but the data under Treatments II, III, and IV, show little sign of any regular correspondence between the degree of restriction and the grading results. Taken as a whole the restricted and full-fed pigs show the following back-fat grading percentages.

	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
	%	%	%	%
Full fed (41 pigs) ..	22	39	31	8
		61		
Restricted (38 pigs) ..	58	21	18	3
		79		

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Gross Surplus. Four out of the five treatments show a gross surplus of returns over food costs in favour of restriction, the one exception being Treatment III (15 per cent. restriction after 85 lb.). Of the two pairs under this treatment, one pair (E_2 , F_2) showed a small surplus in favour of restriction, and the other (E_1 , F_1) a rather larger deficit. The apparently anomalous result under this treatment is thus clearly traceable to individual variations within the groups. The other treatments show surpluses ranging from 2s. 3d. (Treatment V) to 4s. 5d. (Treatment II) per pig. Out of the nine pairs of pens of five pigs each used for the comparisons, the restricted pen showed a surplus over the full-fed pen in seven instances. Since there was practically no difference in expenses other than food, it is clear that in this particular test a small extra profit was obtained by restriction, amounting roughly to an average of 2s. 6d. per pig. As pointed out above, however, this result can only be accepted as valid for the particular combination of circumstances in which it was carried out.

On the detailed variations of treatment included in the test the results give no reliable guidance, and it is safe to conclude that, owing to the great variations between individual pigs under group-feeding conditions, the differences of treatment in question cannot be measured with any degree of certainty by work on the scale here used. Clearer guidance may be expected from a repetition on a larger scale of part of the test that is now in progress, but the problem is too complicated to permit of satisfactory solution by work at any one centre. It is essentially one for co-operative investigation on a common plan by institutions and others who have the necessary facilities. Only in this way can we obtain records sufficient in number and variety to give a fair sample of the conditions under which pigs are being fed in practice.

PRICES OF FEEDING STUFFS

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
Wheat, British ..	£ 9 17	£ 0 8	£ 9 9	72	s. d. 2 7	d. 1·38	9·6
Barley, British, feeding	8 0	0 8	7 12	71	2 2	1·16	6·2
Argentine ..	8 12	0 8	8 4	71	2 4	1·25	6·2
Danubian ..	8 15	0 8	8 7	71	2 4	1·25	6·2
Persian ..	8 10*	0 8	8 2	71	2 3	1·20	6·2
Oats, English, white ..	8 10	0 9	8 1	60	2 8	1·43	7·6
" black & grey ..	8 3	0 9	7 14	60	2 7	1·38	7·6
Scotch, white ..	9 13	0 9	9 4	60	3 1	1·65	7·6
Canadian, No. 2							
Western ..	10 7*	0 9	9 18	60	3 4	1·79	7·6
Canadian, mixed feed ..	7 12	0 9	7 3	60	2 5	1·29	7·6
Maize, Argentine ..	6 5	0 7	5 18	78	1 6	0·80	7·6
Danubian Gal. Fox ..	6 10†	0 7	6 3	78	1 7	0·85	7·6
South African, No.							
2 white flat ..	7 0†	0 7	6 13	78	1 9	0·94	7·6
Beans, English, winter	6 15	0 16	5 19	66	1 10	0·98	19·7
Peas, English, blue ..	11 5	0 14	10 11	69	3 1	1·65	18·1
Japanese ..	22 10†	0 14	21 16	69	6 4	3·39	18·1
Dari	8 5†	0 8	7 17	74	2 1	1·12	7·2
Milling offals :—							
Bran, British ..	7 17	0 15	7 2	43	3 4	1·79	9·9
broad ..	8 10	0 15	7 15	43	3 7	1·92	10
Weatings† ..	8 5	0 14	7 11	56	2 8	1·43	10·7
Superfine† ..	8 15	0 12	8 3	69	2 4	1·25	12·1
Pollards, imported ..	7 10	0 14	6 16	50	2 9	1·47	11
Meal, barley	9 17	0 8	9 9	71	2 8	1·43	6·2
" grade II ..	9 2	0 8	8 14	71	2 5	1·29	6·2
" maize	7 0	0 7	6 13	78	1 8	0·89	7·6
" germ	7 2	0 11	6 11	84	1 7	0·85	10·3
" locust bean ..	7 15	0 5	7 10	71	2 1	1·12	3·6
" bean	8 10	0 16	7 14	66	2 4	1·25	19·7
" fish (white) ..	14 15	2 1	12 14	59	4 4	2·32	53
Maize, cooked, flaked ..	7 7	0 7	7 0	84	1 8	0·89	9·2
" gluten feed ..	7 5	0 12	6 13	76	1 9	0·94	19·2
Linseed cake—							
English, 12% oil ..	10 2	1 0	9 2	74	2 6	1·34	24·6
" 9%	9 10	1 0	8 10	74	2 4	1·25	24·6
" 8%	9 5	1 0	8 5	74	2 3	1·20	24·6
Cottonseed cake,							
English, Egyptian seed, 4½% oil ..	6 0	0 17	5 3	42	2 5	1·29	17·3
Cottonseed cake,							
Egyptian 4½% oil ..	5 17	0 17	5 0	42	2 5	1·29	17·3
Cottonseed cake, decorticated, 7% oil..	9 0†	1 7	7 13	68	2 3	1·20	34·7
Cottonseed meal, decorticated, 7% oil..	9 0†	1 7	7 13	70	2 2	1·16	36·8
Coconut cake, 6% oil ..	7 10	0 17	6 13	77	1 9	0·94	16·4

PRICES OF FEEDING STUFFS (continued)

Description	Price per ton	Manuri- al value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Protein equiv.
Ground nut cake, decorticated, 6-7% oil	£ 9 15†	£ 1 7	£ 8 8	73	2 4	1·25	41·3
Ground nut cake, imported decorticated, 6-7% oil	8 12	1 7	7 5	73	2 0	1·07	41·3
Palm-kernel cake, 4½-5½% oil	7 10†	0 12	6 18	73	1 11	1·03	16·9
Palm-kernel cake meal, 4½% oil	7 7†	0 12	6 15	73	1 10	0·98	16·9
Palm-kernel meal, 1-2% oil.	6 17	0 12	6 5	71	1 9	0·94	16·5
Feeding treacle ..	5 0	0 8	4 12	51	1 10	0·98	2·7
Brewers' grains, driedale	6 5	0 11	5 14	48	2 4	1·25	12·5
Brewers' grains, dried porter	5 17	0 11	5 6	48	2 2	1·16	12·5

* At Bristol. § At Hull. † At Liverpool.

‡ In these instances, manurial value, starch equivalent and protein equivalent are provisional.

NOTE : The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex-mill or store. The prices were current at the end of December, 1936, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £11 per ton, then, since its manurial value is £1 per ton as shown above, the cost of food value per ton is £10. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 8d. Dividing this again by 22·4, the number of pounds of starch equivalent in one unit, the cost per lb. of starch equivalent is 1·43d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations, a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices :— N., 7s. ; P₂O₅, 2s. 3d. ; K₂O, 3s. 6d.

FARM VALUES OF FEEDING STUFFS

The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

		<i>Starch equivalent Per cent.</i>	<i>Protein equivalent Per cent.</i>	<i>Per ton £ s.</i>
Barley (imported) .. ..	..	71	6·2	8 12
Maize .. ..	..	78	7·6	6 5
Decorticated ground-nut cake ..	..	73	41·3	9 3
" cotton-seed cake ..	..	68	34·7	9 0

(Add 10s. per ton, in each instance, for carriage.)

The cost per unit starch equivalent works out at 2·01 shillings, and per unit protein equivalent 1·32 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The " food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the November, 1936, issue of the Ministry's JOURNAL, p. 816).

FARM VALUES.

Crop	Starch equivalent	Protein equivalent	Food value per ton, on farm	
			Per cent.	£ s.
Wheat	72	9·6	7 17	
Oats	60	7·6	6 11	
Barley	71	6·2	7 11	
Potatoes	18	0·8	1 17	
Swedes	7	0·7	0 15	
Mangolds	7	0·4	0 15	
Beans	66	19·7	7 19	
Good meadow hay	37	4·6	4 0	
Good oat straw	20	0·9	2 1	
Good clover hay	38	7·0	4 6	
Vetch and oat silage	13	1·6	1 8	
Barley straw	23	0·7	2 7	
Wheat straw	13	0·1	1 6	
Bean straw	23	1·7	2 8	

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d., post free 7d.

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The Agricultural Index Number

THE general index number of the prices of agricultural produce for December is 126 (base 1911-13=100) compared with 125 for the previous month and 114 for December, 1935. (If allowance be made for payments under the Wheat Act, 1932, and the Cattle Industry (Emergency Provisions) Act, 1934, the revised index is 130.) During the month under review, all classes of fat stock and poultry showed a seasonal rise in price, but in the case of fat cattle and sheep this was relatively less than in the base years. Quotations for wheat, oats, butter, potatoes and wool also were higher, but those for barley, eggs, cheese and hay declined.

Monthly index numbers of prices of Agricultural Produce. (Corresponding months of 1911-13 = 100.)

Month	1931	1932	1933	1934	1935	1936
January	130	122	107	114	117	119
February	126	117	106	112	115	118
March	123	113	102	108	112	116
April	123	117	105	111	119	123
May	122	115	102	112	111	115
June	123	111	100	110	111	116
July	121	106	101	114	114	117
August	121	105	105	119	113	119
September	120	104	107	119	120	127
October	113	100	107	114	113	125
November	112	101	109	114	113	125
December	117	103	110	113	114	126

Revised monthly index numbers of prices of Agricultural Produce, allowing for payments under the Wheat Act (a) and the Cattle Industry (Emergency Provisions) Act (b).

Month	1932	1933	1934	1935	1936
January	-	111	119	124	125
February	-	110	117	122	123
March	-	106	112	118	122
April	-	109	116	126	128
May	-	105	116	117	120
June	-	104	114	117	121
July	-	104	117	120	121
August	108	108	122	120	124
September	108	111	125	128	133
October	104	112	121	119	129
November	105	113	120	119	129
December	107	114	120	120	130

(a) Commenced August, 1932. (b) Commenced September, 1934.

Grain. At an average of 8s. 8d. per cwt., wheat advanced by 1d.; the rise, however, of 4 points in the index to 118 was

MISCELLANEOUS NOTES .

due more to a fall of 2d. per cwt. in the base price. Quotations for barley fell by 3d. to 9s. 6d. per cwt., but, as a similar reduction was recorded during the corresponding months of 1911-13, the index at 115 remains unchanged. Oats averaged 7s. 1d. per cwt. against 6s. 10d. a month earlier and the index shows an increase of 3 points to 101. In December, 1935, wheat averaged 5s. 8d. per cwt., barley 8s. 3d., and oats 5s. 10d., and the relative indices were 77, 100, and 83.

Live Stock. Fat cattle prices were higher on the month, the average of second quality at 32s. 7d. per live cwt. being 1s. 4d. more than in November. This rise, however, is not so pronounced as that which occurred during the base years, and in consequence the index declines from 93 to 91. The addition of the subsidy under the Cattle Industry (Emergency Provisions) Act, 1934, raises the index to 105. At an average of 10½d. per lb. for second quality, prices of fat sheep rose by ½d., but, at 128, the index is lower by 2 points owing to the increase in the base period being proportionately greater. Quotations for baconers advanced from 11s. 10d. to 12s. 5d. per score (20 lb.) and those for porkers from 13s. 9d. to 14s. 3d., the relative indices rising from 118 to 124 and 126 to 131.

Compared with November, both dairy cows and store cattle were dearer. The index for the former at 111 is higher by 2 points and that for the latter at 98 by 3 points. Store sheep and pigs made slightly more money; the respective indices are 113 and 156.

Dairy and Poultry Produce. There was no alteration in the regional contract price of milk during December and the index continues at 171. Butter sold at an average of 1s. 2½d. per lb. against 1s. 2d. in November, the index rising by 1 point to 98. At 17s. 11d. per 120, quotations for eggs were reduced by 1s. 8d., and, in consequence, the index falls by 5 points to 106. Cheese was slightly lower in price; a firmer tendency in the base prices accentuates the fall in the index which is of 4 points to 103. All classes of poultry sold at higher prices and the combined index rises from 116 to 119.

Other Commodities. At £7 17s. 6d. per ton, the average price of potatoes showed a rise of 9s., the index at 220 comparing with 209 a month earlier. Both descriptions of hay sold at rather less money, and the combined index at 98 shows a decline of 4 points. Wool rose in price by 1½d. to 1s. 3½d.

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per lb. and an advance in the index from 107 to 118 is recorded.

Monthly index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity	1934		1935		1936		
	Dec.	Dec.	Sept.	Oct.	Nov.	Dec.	
Wheat	66	77	98	113	114	118	
Barley	104	100	124	119	115	115	
Oats	95	83	98	99	98	101	
Fat cattle	90	91	98	95	93	91	
„ sheep	119	119	131	131	130	128	
Bacon pigs	107	98	111	114	118	124	
Pork	124	110	109	119	126	131	
Eggs	97	110	124	141	111	106	
Poultry	110	120	113	115	116	119	
Milk	171	171	202	171	171	171	
Butter	82	93	98	98	97	98	
Cheese	93	87	106	101	107	103	
Potatoes	133	185	149	202	209	220	
Hay	104	84	105	102	102	98	
Wool	84	91	100	102	107	118	
Dairy cows	103	104	103	107	109	111	
Store cattle	82	92	97	95	95	98	
„ sheep	99	106	132	132	117	113	
„ pigs	148	131	138	150	155	156	

Revised index numbers due to payments under the Wheat Act and the Cattle Industry (Emergency Provisions) Act.

Wheat	118	124*	130	131	130	133
Fat cattle	103	105	113	109	108	105
General Index	120	120*	133	129	129	130

* Superseding figure previously published.

Investigations into the Brood Diseases of Bees

SOME three years ago, as reported in the January, 1935, issue of this JOURNAL, an investigation into the cause and treatment of so-called "Foul Brood" diseases of bees was initiated at the Rothamsted Experimental Station, Harpenden, under the direction of Dr. H. L. A. Tarr. Results have been reported from time to time in technical and scientific journals, and were summarized at the Conference on Bee Diseases held at Rothamsted in September last. Dr. Tarr has shown that European and American Foul Brood are two distinct diseases with different causal organisms. The latter is due to *Bacillus larvae*, its incidence being independent of the strength of the colony, while the former is usually a disease of weak stocks,

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probably caused by *Bacillus pluto*n in association with other organisms. He has drawn attention to a third condition known as "Addled Brood," forming approximately one-third of the cases received for examination. This is due to a defective condition of the queen, and can be cured by re-queening. The Research Committee and the British Bee-keepers' Association are of opinion that the investigations should be continued. It is estimated that the annual cost will be £550, towards which the Agricultural Research Council has sanctioned an increased grant of £300 for the current year on condition that a further sum of not less than £250 is contributed from other sources. An appeal has been circulated to societies and individuals having an interest in this matter to send donations, or an annual contribution for the three years, to the Secretary, Rothamsted Experimental Station, Harpenden, Herts.

Foot-and-Mouth Disease.—An outbreak of Foot-and-Mouth Disease was confirmed at Donnington, Ledbury, Hereford, on January 16. The usual Infected Area restrictions were imposed over an area of approximately 15 miles round the infected premises. The area under restrictions lies within the counties of Gloucester, Hereford and Worcester.

No further outbreak occurred in the Staffordshire and Warwickshire Infected Area, and the area was, therefore, released from restrictions on January 18.

A further outbreak was confirmed at Flagg in the Derbyshire Infected Area, on January 9, but nevertheless, the Area was contracted on January 13 to one extending to approximately five miles round the infected premises at Flagg.

Farm Workers' Minimum Rates of Wages.—A meeting of the Agricultural Wages Board was held at King's Buildings, Smith Square, London, S.W.1, on Tuesday, January 12, 1937, the Rt. Hon. The Viscount Ullswater, G.C.B., presiding.

The Board considered a notification from the Kesteven and Lindsey (Lincolnshire) Agricultural Wages Committee of its decision to fix minimum and overtime rates of wages to come into force on January 31, 1937 (i.e. the day following that on which the existing rates expired), and to continue in operation until January 29, 1938. The minimum rates for male workers of 21 years of age and over are: (1) waggoners, 39s. (as at present) per week of 52½ hours in the weeks in which Good Friday, Coronation Day and Christmas Day fall, 50 hours in the week in which August Bank Holiday falls, 58 hours in any other week in the period from May 14 to October 14, and 61 hours in any other week during the remainder of the year; (2) shepherds, 37s. (as at present) per week of 45½ hours in the weeks in which Good Friday, Coronation Day and August Bank Holiday fall, 55 hours in any other week in summer, 47½ hours in the week in which Christmas Day falls and 56 hours in any other week in winter, with additional payments for the lambing season; (3) stockmen, 38s. (as at present) per week of 46½ hours in the weeks in which Good Friday, Coronation Day and August Bank Holiday fall, 56 hours in any other week in summer, 49½ hours in the week in which Christmas Day falls and 58 hours in any other week in winter; and (4) other male workers,

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32s. (as at present) per week of 41 hours in the weeks in which Good Friday, Coronation Day and August Bank Holiday fall, 50 hours in any other week in summer (instead of 42 hours and 51 hours respectively as at present) and 39½ hours in the week in which Christmas Day falls and 48 hours in any other week in winter; with overtime in the case of all classes of male workers at 10d. per hour on weekdays and 1s. per hour on Sundays (instead of 9d. and 11d. respectively as at present). Provision is made for an adjustment of the hours in respect of which the minimum weekly wage is payable in the weeks in which Easter Monday and Boxing Day fall, to meet cases where holidays are given in those weeks instead of in the weeks in which Good Friday and Christmas Day fall. For female workers of 17 years of age and over the minimum rate is unchanged at 5½d. per hour for all time worked.

Enforcement of Minimum Rates of Wages.—During the month ending January 13, 1937, legal proceedings were taken against six employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow:—

Committee Area	Court	Fines Imposed	Costs Allowed	Arrears of Wages ordered	No. of workers involved
		£ s. d.	£ s. d.	£ s. d.	
Northants ..	Daventry ..	5 0 0	0 2 6	28 13 9	1
Notts ..	Retford ..	5 0 0	0 5 0	44 0 0	1
" "	" Knaresboro'	5 0 0	0 2 6	33 18 7	1
Yorks, W.R	2 0 0	—	—	17 10 3	1
Caernarvon	Bettws-y-coed	1 0 0	0 13 6	3 9 6	1
Denbigh ..	Llanrwst ..	0 10 0	0 5 0	5 0 0	1
		18 10 0	1 8 6	132 12 1	6

APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS: ENGLAND

Hampshire: Mr. C. P. Quarrell, B.Sc., has been appointed Assistant Horticultural Adviser.

Lancashire: Miss M. M. Haley, N.D.D., has been appointed Assistant Instructor in Dairying, *vice* Miss G. V. Moore, N.D.D.

Norfolk: Mr. W. J. West, B.A., Dip. Agric., has been appointed Agricultural Advisory Officer, and will take up his duties on February 1, 1937.

Shropshire: Mr. A. McVicar, B.Sc. (Agric.), N.D.A., N.D.D., has been appointed Chief Agricultural Officer, and will take up his duties on April 1, 1937, on the retirement of Mr. E. Druce, M.R.A.C.

Wiltshire: Mr. J. J. S. Webster, N.D.A., M.R.A.C., has been appointed Temporary Assistant Instructor in Dairying, *vice* Mr. J. A. Wyatt, B.Sc. (Agric.), N.D.A., N.D.D.

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Feeds and Feeding: A Handbook for the Student and Stockman.
By F. B. Morrison. 20th edition. Pp. vi + 1050. Illus. (Ithaca, New York : The Morrison Publishing Co., 1936. Price \$5.00).

This American textbook needs no introduction to students of animal husbandry in this country. For many years, in earlier editions, it has occupied a place of honour on their bookshelves in company with that German classic, Kellner's treatise on the feeding of domestic animals.

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The first edition was written by Prof. W. A. Henry, one of the foremost agricultural authorities of his times. It was published in 1898 and gained immediate favour among agriculturists in the United States. From that year until 1935 no fewer than nineteen editions were issued, several printings being made of each of the later editions. It was entirely rewritten in 1910 by Prof. Henry with the help of the present author, Prof. Morrison, who, in the succeeding years assumed the sole responsibility for the revisions necessitated by new editions of the work. The senior author died in November, 1932, at the age of 82 years.

Appealing as it does to scientific man and practical stockman alike, the treatise has grown steadily in popularity with the years and is now familiar to students of animal husbandry in almost every country. It has been translated into Russian and Portuguese. Its gradual evolution through successive editions has contributed to its solidity and comprehensiveness, but its original "readableness" has not been sacrificed. It is, in short, the almost perfect textbook.

In the preparation of this entirely rewritten edition, Prof. Morrison explains that he has spent much time during the past few years in compiling and analysing the results of experiments on live-stock feeding conducted in all parts of the world. The results of these studies are incorporated in the new edition, which thereby becomes as up to date as it is possible for any textbook to be in this age of intensive research and discovery.

The printing, illustrating, and binding of the book are in every way worthy of the treatment of the subject. That it is intended primarily for American agriculturists should by no means deter the British reader from including this excellent treatise in his collection of works dealing with the problems of live-stock feeding.

English Farming, Past and Present. By Lord Ernle. 5th edition. Edited by Sir A. D. Hall (Longmans, Green & Co. 15s. net.)

Lord Ernle's masterpiece requires no introduction. The book was first published in 1888 (under the title of *The Pioneers and Progress of English Farming*) ; it was first issued under its present title in 1912, since when it has passed through four editions and two new impressions, and has become a familiar source of reference to almost a generation of agriculturists. In this fifth edition, edited by Sir Daniel Hall, about fifty pages have been revised or added, and the story has been brought up to date.

Apart from a short addition to the chapter on tithe, revision of the text first occurs with the period following the great depression of the 70's and 80's of last century, and the course of the gradual recovery from then up to the Great War has been rewritten. The part played then and subsequently by research and education is expanded in a separate section, while further new chapters are entitled Agricultural Legislation since the War, Small Holdings, and Technical Progress since the War. The appendices have also been modernized by bringing the statistics of crop acreages and live-stock numbers up to date, and by including the index numbers of prices since 1918.

Sir Daniel is to be congratulated on the way in which he has performed his task—no light one in view of the high standard set by Lord Ernle. He has, indeed, contributed a very valuable and readable addition to what must always remain a classic work on English agriculture. His task has been all the more difficult in that he is dealing with conditions and movements so recent that their ultimate importance can scarcely yet be assessed. One is rather disposed to question some of his points dealing with technical progress since the War. For example, after describing the introduction and spread of tractors, he continues (p. 452)

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that "A greater revolution in the application of power to the farm came later, as the capacities of the 'combine' machines used in America and Australia for harvesting cereals, became known in this country." This statement seems to be laying undue emphasis on the combine, for a quite negligible proportion of British farms were equipped with these machines even in 1936. Then again, one may ask what evidence there is for the statement (p. 471) that in recent years "throughout the agricultural industry a tendency towards specialization may be noticed; the old mixed farming is being exchanged for businesses chiefly concerned with one or two kinds of production." Sir Daniel's interpretation is strangely in contrast with Lord Ernle's dictum (4th edition, p. 383) that "variety is one of the enforced improvements in modern farming." Considering the marked increase in the potential number of products now open to farmers in comparison with, say, fifty years ago (e.g., poultry, milk, sugar-beet, potatoes, vegetables, fruit, flowers), the evidence surely tends to support Lord Ernle. It is true, of course, that modern machinery and methods have greatly increased the size of the "economic unit" in production, but this is quite another matter from "specialization" in the sense in which Sir Daniel uses the word.

Except for these, and a few minor criticisms, this new edition deserves unstinted praise. No man is better qualified than Sir Daniel Hall to describe the development of and part played by education and research in recent years, and his account of agricultural legislation since the War, though necessarily cursory, is clear and helpful. The volume is produced in the quality of printing and paper to which we have become accustomed in previous editions.

The Earth Goddess: A Study of Nature Farming on the West African Coast. By G. Howard Jones, M.A. Pp. vii + 205 and 8 Figs. (Published for the Royal Empire Society. London: Longmans, Green & Co., 1936. Price 12s. 6d.)

Though this book begins with a chapter of ethnology and a brief account of West Coast religions, it is really a discussion of African native agriculture. The point the author makes is that primitive agriculture is entirely bound up with social organization, and therefore with tribal custom, which finds its sanctions in religion. When the white man intrudes and essays to improve the simple and apparently wasteful systems of farming that he finds prevailing, not only may he make technical mistakes because he has not a sufficient experience of the conditions of the problem, but he may find himself cutting across some of the most deeply-rooted instincts of the tribe. For example, in South and East Africa the whole question of the preservation of the land in its present state of fertility, even of the very land itself, depends upon effecting a reduction in the numbers of live-stock kept by the Bantu tribes. In many instances the cattle are neither milked nor eaten, only the hides and skins being turned to economic purpose, and yet they are multiplied as tokens of wealth and status.

Again, the handing over of cattle is part of the ceremony of marriage, whereby the woman is accepted into the family—the most intimate bond in tribal organization. With the cessation of war and raiding, cattle, sheep, and goats have increased until they have bared the grazing grounds of vegetation and exposed the soil to such intense erosion as to make deserts of great tracts that formerly carried stock and game.

Mr. Howard Jones is concerned with the impact of the white man and his methods of farming upon the native communities. He recognizes the splendid work done by the officers of the agricultural departments in the native reserves, but he wants a consideration of the general policy that should be adopted. He has little interest in the white settlements

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and other plantation types of farming, and does not incline to the idea that they contribute much to the education of the natives in better practices. Although they have introduced to the African cash crops for sale, these new cultivations often impair tribal customs of land tenure and deflect the cultivator from the all-important food crops. He recognizes that in some way or other individual ownership, or, at least, individual security of tenure, must replace the tribal ownership and shifting cultivation prevailing over so much of Africa, but perhaps he attaches too much importance to possession. He quotes Arthur Young's dictum: "Give a man the secure possession of a bleak rock and he will turn it into a garden: give him a nine years' lease of a garden and he will convert it into a desert." Where will men look with their own eyes and see how often possession confirms a man in a sterile tradition? However, Mr. Howard Jones is a confirmed "smallholder" advocate, with its usual sequence of agricultural co-operation and Folk High Schools. His book is interesting and suggestive, but it does make one wonder whether he is being true to his earlier text—that one cannot transplant European systems wholesale with Africa.

Growing Pastures in the South. By Joseph F. Combs, B.S. Pp. ix + 270, and 78 Figs. (Chapel Hill: University of North Carolina Press, 1936. Price 9s.)

This is in the nature of a handbook on pasture management, more particularly for those concerned with the Southern States of the United States of America.

To the British reader the chief impression left on the mind is the enormous scope that exists for pasture improvement in the United States, and the immense amount of investigation that still awaits to be undertaken. The author deals with his subject in a straightforward manner, and, as far as he goes, presents a considerable amount of well-arranged and accurate information.

In discussing manuring, he lays chief emphasis on the value of phosphates, and stresses the necessity of ascertaining the phosphate requirement of the soil. His references to lime are scanty and somewhat incidental, and this is most noteworthy in a comprehensive chapter on the inoculation of legumes, in which no allusion is made to the essential part played by calcium in connexion with the proper development of the nodule organism; in a subsequent chapter, however, he rather casually notes that lime is necessary for the proper growth of red clover.

Six chapters are devoted to a description of the more important grasses and of their uses, and five to leguminous plants. The important question of strain and variety is, however, to all intents and purposes completely ignored. Thus, in the discussion on red clover no distinction is made between the early- and late-flowering varieties, although it is pointed out that the strains of red clover that have been developed in the United States are superior to imported European strains for use in that country. White clover is dealt with under two headings only, "White Dutch" and "Ladino." The strains of white clover met with in the blue grass pastures are, however, very different in the aggregate from "White Dutch" as properly understood, and from the point of view of American pastures it cannot be doubted that there is scope for an immense amount of breeding work with white clover collected from such pastures.

The seeds mixtures prescribed in the closing chapter have the appearance of being sensible, and all of them are at least simple, but in practically every instance they have been drawn up in sole relation to soil type, and without regard to the all-important question of subtle differences in management. Where hay as such is mentioned (e.g., West Virginia),

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nothing is said as to the date when fields are closed in relation to seeds mixture.

The index is complete in so far as the various species of plants are concerned, but slight in other directions; thus, calcium, though referred to at least once in the text, finds no place in the index.

This is hardly a book in which the British student of grass land will find information of a sort likely to be of great value to him, either in the realm of facts or of ideas.

Rich Land, Poor Land : A Study of Waste in the Natural Resources of America. By Stuart Chase. Pp. x + 361, 11 Figs. and 9 maps. (London : McGraw-Hill Publishing Company, Ltd., 1936. Price 10s. 6d.)

The problem of the wastage and destruction of soils has occupied the attention of soil investigators for more than a generation. During recent years it has been brought to the notice of a wider public and has become, in certain countries, the subject of action by the State. In no country has the menace of soil wastage been more acutely felt than in the United States. Losses by water erosion have been going on since the earliest white settlements; but so long as there was an apparently inexhaustible area of land for new colonization these losses were accepted with complacency. Early in the present century, settlement was practically completed, and the limited extent of the agricultural resources of the country was realized. The spectacular losses by wind erosion during recent abnormal droughts have served to focus public attention on a problem that has long been known to exist.

Mr. Chase's book is a remarkable exposition of the problem of wastage, and more particularly the wastage of soil by destructive erosion. Although written for a lay public, it is based on trustworthy data, which are handled with conspicuous ability. The evils proceeding from the unintelligent exploitation of the soil are clearly traced, and the urgent necessity for national action is emphasized. Since it is known that about 30 per cent. of all the farm lands of the United States are either destroyed, damaged, or menaced by erosion, the gravity of the situation cannot be too forcibly represented to the American people. The institution of the Soil Conservation Service in 1935 shows that the Government is aware of the problem.

Mr. Chase is not wholly alarmist. He expounds clearly the principles of soil reclamation and conservation, and illustrates them by an account of the work of the famous Tennessee Valley Authority, set up as part of Mr. Roosevelt's "New Deal." From this account it would appear that the regeneration of this valley, a region of 40,000 square miles stricken by soil erosion, drought, and flood, could only be accomplished on the plea of improving navigation in the Tennessee River and its tributaries. Navigation, however, implies flood control; flood control implies dams and reservoirs; reservoirs must be protected from silting up, and hence erosion must be checked; erosion control implies agricultural reconstruction and planned utilization of the land. And thus, starting with the innocent object of improving river navigation, an organization has been developed which touches the whole economic and social life of the valley.

"Rich Land, Poor Land" has its lessons for the British Empire. There are great areas in Africa and elsewhere in which soil destruction is proceeding rapidly and irrevocably. This remarkable and fascinating book should be read by all who have sufficient interest in public affairs to realize the importance of land as a national resource. It might well be ranked as a companion volume to Stapledon's "The Land, Now and To-morrow," reviewed in this JOURNAL for January, 1936.

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Profit from Fertilizers. By Six Authors. Preface by Viscount Bledisloe.
Pp. 176 and 20 Figs. (London : Crosby, Lockwood & Son, Ltd.,
1936. Price 7s. 6d.)

This book, which contains sections by H. V. Garner, H. C. Long, A. H. Hoare, R. G. Stapledon, F. Rayns and T. Wallace, shows how the best use can be made of the gradually diminishing supplies of farmyard and other organic manures by an adequate appreciation of the value of inorganic fertilizers. Many farmers, though admitting that artificial fertilizers will increase the yields of their crops, are often in doubt as to whether the value of the increase will cover the cost of the fertilizer treatment. The object of *Profit from Fertilizers* is to tackle the subject from this standpoint of "profitableness."

The elements of plant nutrition and the properties and composition of farmyard manure, organic manures, artificial fertilizers and lime are briefly discussed. Chapter III, entitled "Compound and Concentrated Fertilizers," deals chiefly with the so-called concentrated complete fertilizers. These are admittedly a recent addition to the list of fertilizers and an account of their composition and properties is welcome. The reader is tempted to ask, however, whether the principles underlying their use are so very different that the manufacturers' recommendations for individual crops must necessarily precede the chapters, written by the chief contributors to the book, on the manuring of the various crops.

A concise but critical account of the principles of grassland manuring, by Professor R. G. Stapledon, is followed by a chapter devoted to the improvement of hill pastures by the same writer. This section is both interesting and stimulating, and serves to illustrate some of the present-day methods of attacking grassland problems as well as providing much valuable information.

Mr. Rayns then deals with the manuring of arable crops, and gives a general review entitled "Manuring the Rotation." This review presents the whole problem of the manuring of arable crops in a form that will be appreciated by the practical farmer, and, like the rest of this section, gives considerable prominence to the financial aspect of the use of fertilizers.

In the section on the Manuring of Fruit Trees, by Dr. T. Wallace, the reader is warned at the outset of the complexities of the problem, but the account is so arranged that he finds himself led to a clear understanding of the difficulties involved. It is obvious that there is much sound experimental evidence underlying the recommendations in this section. Attention is also given to the results of recent research work on the effects of manuring on quality and storage troubles.

In the section on Market Garden and Flower Crops, by A. H. Hoare, it is stated that "very little carefully organized field experimental work has been carried out on vegetable crops in England." Hence, the information on many of the 34 vegetable crops considered, is in the nature of general recommendations. The author of this section advocates the practice of considering fertilizer requirements in terms of fertilizer ratios, but, for some reason, does not adopt the method in the case of all vegetable crops, and, when dealing with flowers, adopts the method for one crop only.

There are very few errors in the text ; no doubt the discrepancy between the heading and footnote in Appendix III and the reference on p. 77 to the illustration facing p. 80, will be corrected in due course.

The book is attractively produced and will afford useful guidance to practical farmers, especially those seeking to take advantage of the large amount of experimental work on fertilizers, carried out in recent years. It will also serve to introduce the student to many of the practical problems associated with the use of fertilizers.

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Hardy Fruit Growing. By Sir Frederick Keeble and A. N. Rawes.
Pp. xi + 334, and 21 Figs. (London : Macmillan & Co., Ltd., 1936.
Price 16s.)

The names of the joint authors will lead readers to expect a reliable summary of the present state of knowledge and experience in regard to fruit-growing out of doors in this country and they will not be disappointed. The many aspects of this not too simple subject are presented in an easily assimilable form, and, when recommendations are made, the reasons that are thought to underlie them are given in simple language. The information provided should enable beginners to obtain a fair grasp of the subject, and will remind experienced fruit-growers of points they have overlooked.

The book is divided into three sections, the first of which deals with the general principles and practice of fruit-growing. Information is given as to the suitability of different soils and situations, preparation of the ground and protection of fruit trees against wind and vermin. Then follows an account of the kind of trees and bushes to buy, the methods of cultivation, manuring and pruning. The defence of trees against attack by insect pests and disease, renovation of old trees, and finally the picking and storing of all fruits. In covering such a large range of subjects, many of which have never been fully explored by science, it would be surprising if there were not two opinions about some of them.

The remarks on soils are particularly good, but, though reference is made to the need for more soil surveys, no mention is made of the various official bulletins, which cover the surveys that have already been completed. A valuable and still much needed warning against overcrowding is given, but some of the distances given in the table seem quite inadequate. It is strange to find that half-standard apples are only to be allowed a quarter the area allotted to standards, although, if the varieties and stocks are the same, the trees might be expected to attain the same spread. The spaces allowed for bush and cordon apple trees are also rather small, except under very poor growing conditions. Although information is given on planting, the arrangement of the trees and methods of marking out, points that cause a lot of trouble in practice, are not mentioned. It appears to be assumed that all good fruit must be grown on cultivated land. The view that apple trees (not necessarily standards) are more easily controlled and produce fruit of better quality on grass land, is not even mentioned. The chapter on manuring is of great value, but the recommendation of chemical analysis of the soil, as a means of ascertaining what manures are required, is surprising, in view of its general failure in practice. The best time for the application of nitrogenous artificial manures to fruit trees has not been determined. Many fruit-growers obtain better results by applications on cultivated ground made earlier than the dates mentioned and very much earlier on grass.

The chapter on pruning is excellent, though its relative importance seems to be somewhat exaggerated. No mention is made of other ways (e.g., manuring) in which similar and sometimes better results can be obtained. Good management, as the first line of defence against pests and disease, is wisely stressed, but good spraying, the second and final line of defence, is very inadequately treated.

Section II contains information on the varieties of fruit to plant, and is intended to be used as a work of reference. Particularly useful are the dates of flowering, information on cross-pollination and varieties, though some of the varieties listed as "commercial" would not be planted as such to-day. Brief notes on the pests and diseases attacking each kind of fruit are given. Growers of Bramley will be surprised to find that it is described as resistant to scab. In dealing with blackcurrants the

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warning that only disease-free material should be planted, might have been repeated, as has been done in the cases of raspberries and strawberries. The value of planting disease-free material has never been so thoroughly demonstrated, as with blackcurrants.

Section III is described as an introduction to Commercial Fruit-growing. Major Monro contributes a useful chapter on "What Markets and Public Want," and brief references are made to planning and marketing, and to strawberries under glass. The book as a whole will be most useful to all fruit-growers, whether they grow for pleasure or profit.

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<i>Station and Date</i>	<i>Time : p.m.</i>	<i>Speaker</i>	<i>Subject</i>
National : Feb. 1, 8, 15, 22	6.20	Mr. J. G. Stewart	For Farmers only.
Midland : Feb. 5	8.0	Mr. C. H. Gardiner	Our County Correspondent ; Worcestershire.
" 11	6.40	Mr. W. B. Thompson	For Midland Farmers.
" 15	7.30	Mr. Graham Castle	Our County Correspondent : Gloucestershire.
North : Feb. 5	7.30	Mr. W. E. Shewell-Cooper	Fruit Growing in the North.
" 12	8.10	Messrs. W. B. Mercer and William Dutton	Pig-keepers.
" 26	6.40	Mr. A. McVicar	Early potatoes.
Western : Feb. 4, 18	6.50		Fortnightly Letter to Western Farmers.
" 11	6.40	Messrs. A. W. Ling and T. R. Ferris	For Western Farmers.
" 25	6.40	Messrs. A. W. Ling and C. D. Ross	For Western Farmers.
Wales : Feb. 5	8.30	Mr. Moses Griffith, Dr. T. J. Jenkin, Mr. Trevor Thomas and Mr. Jarvis	Pasture and Grass Culture (in Welsh).
" 19	7.30	Messrs. Moses Griffith and R. J. Gardner	Discussion on Store Cattle (in Welsh).
Scottish : Feb. 4	6.25	Dr. W. G. Ogg	Soil Research and the Farmer.
" 11	6.30	Mr. A. D. Buchanan Smith	For Scottish Farmers.
" 17	6.40	Messrs. A. R. Wannop, J. F. Duncan, and A. N. Other	Junior Agricultural Clubs.
Northern Ireland : Feb. 5	8.0	Mr. H. O. H. O'Neill	The Care and Handling of Milk.
" 12	8.45	Mr. Peter Fitzpatrick	Farmers' Work and Worry.
" 26	7.30	Mr. Peter Fitzpatrick	Farmers' Work and Worry.

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

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March, 1937

NOTES FOR THE MONTH

Exposure of Overstocked Cows in Markets

THE Ministry desires again to call attention to the practice of exposing for sale in markets overstocked cows, that is to say, cows left unmilked in order to distend the udders and show the animals' capabilities.

In a notice issued some months ago, it was pointed out that the practice is not only quite unnecessary to convince a purchaser that the cow possesses good qualities as a milker, but that, in a very large proportion of such instances, it may involve suffering to the animal, in which event the person responsible renders himself liable to legal proceedings for cruelty under Section 1 of the Protection of Animals Act, 1911, or of the Protection of Animals (Scotland) Act, 1912, as the case may be. In the previous notice an appeal was made to farmers, market authorities, auctioneers and all others concerned, to co-operate in discouraging this very objectionable practice.

Reports since received by the Ministry from various parts of the country indicate that, while the practice of overstocking continues, there is some tendency to improvement, and that the feeling against the practice is growing, and has been stimulated by various articles in the agricultural press and elsewhere. In many quarters, the opinion has been expressed that a more rigorous application of such penalties as are permissible under the Protection of Animals Acts should be aimed at in order to put an end to this cruel practice.

The Ministry desires to take this further opportunity of emphasizing the fact that the overstocking of cows is not necessary to reveal the milking qualities of the animal and that it may not only involve severe suffering, but also have a detrimental effect on the future milking capacity of the cow.

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It makes this further appeal to all concerned to do everything in their power to discourage and put an end to the practice.

Hot-Water Treatment of Narcissus Bulbs

THE hot-water method is now the standard treatment for dealing with narcissus bulbs infested by eelworm, perhaps the worst of all narcissus pests. In addition the method is being adapted to the treatment of other plants, such as strawberries and chrysanthemums, and there are indications that its range of usefulness may be still further extended. Unfortunately, however, the treatment has not in practice given the complete measure of success that on theoretical grounds was to have been expected, and that could usually be obtained in scientific trials. The reasons for these difficulties that have been met with in the hot-water treatment of narcissus bulbs have therefore been investigated during the past few years at the Seale-Hayne Agricultural College by Messrs. Staniland and Barber, and their conclusions have been published by the Ministry in the form of a Bulletin.*

The authors state that unsatisfactory results with bulb baths may be due to a number of different causes, all or any of which may be operating in any given instance. The factor that appears to have led most frequently to the survival of eelworms in treated bulbs is the use of sacks instead of rigid containers in the baths, but other factors, such as inaccurate thermometers or incorrect steam pressures, are little less important. A warning is therefore given as to the need for caution when endeavouring to improve the performance of bulb baths. That improvement is often necessary is, however, clearly indicated, and it is hoped that the information provided in the Bulletin may result in the hot-water treatment giving even greater satisfaction than it has in the past.

Seed Potatoes

THE time will soon be here for planting seed potatoes, and in this connexion growers may get valuable help from a leaflet that the National Institute of Agricultural Botany

* Bulletin No. 105, *The Efficiency of Baths used for the Hot-water Treatment of Narcissus Bulbs*. Obtainable from H.M. Stationery Office, or through any bookseller, price 1s. net (1s. 1d. post free).

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issues free of charge direct to farmers or through the County Agricultural Organizers or Horticultural Advisory Officers.

First early varieties recommended are Arran Pilot (immune from wart disease), Epicure, Ninetyfold, Duke of York, Sharpe's Express and Eclipse. Arran Pilot has fulfilled its early promise, but since it is somewhat susceptible to virus diseases care must be taken to obtain seed from a virus-free crop.

The only true second early worth growing is the old susceptible variety, British Queen. Most of the early maincrops can, however, be lifted soon enough for this purpose, Arran Banner (immune) being particularly suitable.

The best of the maincrops in order of maturity are King Edward, Majestic (immune) and Arran Banner (immune). King Edward is the most popular variety with the consumer and consistently fetches higher prices than others. The yield is lower than those of the other two and in order to produce a bold sample many soils require liberal manuring. Arran Banner yields heavily. Its tubers are apt to be coarse and it is recommended that the sets be planted not more than 12-14 in. apart.

Gladstone is mentioned as an immune substitute for King Edward, which it resembles in yield, cooking quality and tuber characteristics.

Whatever the variety grown, it is of the first importance that healthy seed be used. It is recommended that seed from virus-free stocks should be planted at least every second year.

The Chocolate Spot Disease of Broad and Field Beans

DR. A. R. WILSON, the author of the article under the above title in last month's (February) issue of this JOURNAL, has drawn attention to an error in the caption to Fig. 3 of the illustrations (inset plate facing p. 1048), in which the word "widened" has been printed instead of the word "induced." The caption should read as follows: "Fig. 3.—(Right) Shoot of field bean, taken from a plant growing in a field plot, and showing artificially induced 'non-aggressive' and slight 'aggressive' Chocolate Spot infection. The foliage was sprayed, during wet weather, with a spore suspension of *Botrytis cinerea* in water."

NOTES FOR THE MONTH

Interesting Birds : (1) The Barn Owl

THIS is perhaps the most useful of all our native birds. Its food consists mainly of rodents—rats, mice, and voles being taken by it in large numbers. It also occasionally captures small birds, such as sparrows. The barn owl (see illustration) hunts almost entirely by night, when rodents are most active, and its opportunities for good work are therefore greater than those of any diurnal bird. Every farmer should make it his business to protect and encourage such an asset to the land.

Both adult and young barn owls are very voracious. One observer records that in a single night a pair of barn owls brought to their young no fewer than 27 mice and four rats. Another records an instance in which 20 freshly-killed rats were found in one nesting-hole, while a third states that a half-grown barn owl ate 9 mice in rapid succession and was hungry again in three hours. The barn owl, like other birds of prey, has the habit of disgorging indigestible matter, such as bones and fur, in the form of pellets. One of our greatest ornithologists states that in 700 pellets of this owl he observed the remains of 2,513 mice, 1 mole, and 22 birds, of which 19 were sparrows.

The barn owl is easily identified and is in fact unmistakable. It is about a foot in length. Its face and the whole of its under-parts are pure white. Its upper parts are yellowish buff, beautifully marked with brown, grey, and white. Its legs are covered with white, downy feathers, and its eyes are black.

The barn owl breeds in a variety of situations: in lofts, barns, belfries, and in holes in trees. It makes no nest. Its eggs, which may number from 4 to 7, are dull white and rather rounded in shape. This bird has the habit of laying its eggs by "instalments," so that it is possible to find, at one time and in the same nesting-hole, fresh eggs and young of different ages.

Although the barn owl's true character and great value to agriculture are now more widely known than in the past, it is a regrettable fact that even to-day specimens are shot or otherwise destroyed. The law provides heavy penalties for the killing of barn owls or the taking of their eggs and young. There is some ground for the belief that the species is declining in numbers, which is an added reason why this absurd persecution should be combated in every possible way. Any



Photo Eric J. Hosking.

Barn Owl, with young rat in its beak. A flashlight photograph

To face page 1124.

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farmer who has a pair of barn owls on his land is to be congratulated. They will do him no harm whatever, but will, on the contrary, be working for his benefit all the year round.

The Society of Engineers

Two papers on farm engineering problems were read to the agricultural section of The Society of Engineers during the past session and are reported in full in the Journal of the Society, October-December, 1936. The titles of these papers are, "Some Aspects of Cultivation and Other Power Operations on the Farm," by Dr. B. A. Keen and G. H. Cashen, and "Agricultural Tractor Design" by D. N. McHardy.

In the first of these papers Dr. Keen comments adversely upon the degree of mechanization that has taken place in farming in this country, saying that the horse remains at least as important as steam-engines, internal-combustion engines, and electric motors, and seems likely to continue so for a long time to come. He criticises severely the results of such scientific inquiry as has yet been made into cultivation problems. He says that no definite answers have yet been obtained to the questions: (a) what is the effect, if any, of surface cultivations while the crop is growing? (b) is a perfect tilth essential for a satisfactory crop? and (c) does the farmer get nothing but the satisfaction of artistic achievement from the extra labour? He instances a comparison of deep versus shallow cultivation that has been made in America, seemed to show that deep ploughing was unnecessary, and indicated that it is at least open to question whether at Rothamsted, or elsewhere, subsoiling or indeed any form of deep cultivation will necessarily produce increased yields. He discusses rotary cultivation and compares it with the older forms. He says that rotary cultivation appears to improve germination and early growth, but that the difference does not persist. The yields of arable crops, however, are as great with rotary cultivation as with the older methods.

The paper also discusses the electric motor versus internal-combustion engines, threshing and barley grinding, and much of the discussion that followed it is well worthy of perusal.

The second paper, on Agricultural Tractor Design, dealt with the development of the internal-combustion engine and forms a valuable review of the progress made in bringing that

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machine to its present state of perfection. Mr. McHardy states that the first British oil-engine tractor for agriculture, although not designed as a plough tractor, appears to have been the Ruston-Hornsby that received the Royal Agricultural Society's silver medal at the Manchester Show of 1897. This machine cost £500. Since then, of course, many and various types of farm tractor have been designed and used—and a large number of them abandoned. The author of the paper includes a discussion of the main types that have been produced and of the types that have survived. The discussion that followed the paper was participated in by, among others, Dr. Denham, Colonel Johnson, and Mr. Neale, and it is not too much to say that, although the paper does not venture very far into the realm of prophecy, users of tractors throughout the country will find it full of useful information.

Back Issues of this Journal

THERE may be many readers of this JOURNAL who retain their copies for binding, but whose sets are not complete. The Ministry desire to make it known that although many old issues of the JOURNAL are out of print, at least a few copies of most issues of recent years are still available and can be obtained by readers who wish to fill gaps in their volumes. Of the forty-three volumes completed with this issue, very few numbers of the first ten volumes can now be supplied. If readers will send a note of their requirements to The Controller, His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C.2, they will be informed whether the copies can be supplied. The cost in every instance will be the face value of the relative issue.

Copies of most of the twenty supplements that have been issued with the JOURNAL from time to time are also available, and a list of these may be obtained on application.

Varieties of Cereals and Lucerne for Spring Sowing

A FARMER buying a new car can gain considerable assistance in his choice by studying the results of genuine reliability trials of different makes "drawn from stock." He may not always realize, however, that he can obtain similar, or even greater, help in making his choice of new cereals, for field trials are carried out continuously by the National Institute of

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Agricultural Botany with the sole object of providing reliable information on the comparative merits of the many varieties. Recommendations made on the results of these trials are issued from time to time in leaflet form and can be obtained free of charge through all Agricultural Organizers or direct from the N.I.A.B. For those whose time is very precious the brief summary given below should be a guide for this season's spring sowings.

While not encouraging the growing of spring wheat, since it is seldom a profitable crop, the Institute's experience shows that if this practice is followed, the most satisfactory varieties are Little Joss if drilled by the middle of February, Red Marvel or A.1 for the first half of March, and thereafter until the middle of April, April Bearded.

With regard to oats it recommends Victory, Eagle, Star, Golden Rain, and Golden Rain II—the last two essentially for home consumption, for although very heavy yielders their grain, which is of excellent feeding value, is small and its yellow colour does not find universal favour among purchasers. Marvellous is recommended for early sowing on good soils, as is Resistance, which though primarily a winter variety also produces high yields when sown early in spring. Among the oats still under trial Onward appears very promising.

In barleys the Institute restricts its recommendations to the well-known varieties Plumage Archer and Spratt Archer. The "1935" Plumage Archer has given better results than the "1924." Where late sowing cannot be avoided Svalof Victory or the Danish Kenia and Maja deserve trial.

If lucerne is being sown the Institute advises the Hungarian strain or French Provence strain. English-grown seed of these would be expected to give as satisfactory results as imported seed, provided the germination of the seed was equally satisfactory.

Whichever variety is chosen, early sowing almost always pays. English-grown seed gives just as good results as imported seed, if the standard of purity and germination is the same. A further leaflet dealing in general terms with choice of seed, in which such points as purity, germination, variety, origin and price are dealt with, has been compiled by the Institute, and those who obtain it (*gratis*) either from County Organizers or direct from the Institute should find it of considerable use when deciding what seed to buy.

NOTES FOR THE MONTH

Sampling Observations on Wheat 1936-37: Report for First Quarter

THE present season is the fifth during which the full scheme of observations has been in progress. The Lord Wandsworth Agricultural College, Long Sutton, Hampshire, is not taking part in the scheme this year, but observations have been started at a centre at Carlisle, Cumberland, so that the number of stations continues to be ten, as in the three previous years. The first quarter's observations cover the period from sowing to the beginning of shoot formation, and a summary of the observations is shown in the table below, the stations being arranged in order of sowing date. All stations grow two standard varieties, Squarehead's Master and Yeoman, and a third variety is being grown at four stations.

Weather conditions during October were favourable for the sowing of winter cereals, and, at eight of the ten stations, sowing took place between October 21 and 31. The interval from sowing date to date of appearance above ground is influenced mainly by temperatures, which were above normal in the first fortnight of November. Thus, germination has been fairly rapid this winter, the mean interval from sowing date for the two standard varieties being twenty-two days, with a range from fourteen days at Cirencester to thirty-five days for Yeoman at Newport. The mean intervals and ranges for the past five seasons are compared below:—

Season	1932-33	1933-34	1934-35	1935-36	1936-37
Mean interval (days) ..	23	24	17	29	22
Range (days) ..	10-37	18-39	10-22	10-74	14-35

The outstanding seasons were 1934-35, in which germination was unusually rapid at all stations, and 1935-36, in which it was rapid at the six stations where sowing took place early, but of unprecedented length at the remaining four, owing to severe cold in December. The other three years, 1932-33, 1933-34, and the present season, may be regarded as normal as regards length of germination interval.

Yeoman has generally appeared above ground slightly earlier than Squarehead's Master, and this year it did so at eight stations. Exceptions to this rule usually occur only at stations at which germination has been delayed, as shown this year by the two exceptions, Newport and Carlisle, which had the longest germination intervals.

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The first plant number counts are taken about three weeks after appearance above ground. Plant numbers are somewhat higher than last year at most stations. Newport has again had a poor stand. Yeoman has a higher count than Squarehead's Master at seven stations.

The local varieties have, so far, shown the same rate of progress as the two standard varieties at the four centres where they were grown, and no outstanding differences appear.

SAMPLING OBSERVATIONS ON WHEAT, 1936-37 : FIRST QUARTER

Station	Variety	Sowing date	Appearance above ground		Plant density per 32-metres drill	
			Date	First count	Date	
BOGHALL, Edinburgh	S.H.M.* Yeoman	Oct. 21	Nov. 11 Nov. 10-11	1,961 2,526	Nov. 30	
CIRENCESTER, Gloucestershire	S.H.M. Yeoman	Oct. 22	Nov. 5.09	1,784	Nov. 27	
	Little Joss		Nov. 4.75	2,101		
			Nov. 5.07†	1,732		
ROTHAMSTED, Hertfordshire	S.H.M. Yeoman	Oct. 23	Nov. 9.53	1,533	Nov. 30	
	Victor		Nov. 7.88	1,907		
			Nov. 9.00	1,600		
WOBURN, Bedfordshire	S.H.M. Yeoman	Oct. 26	Nov. 16.75	1,602	Dec. 19	
			Nov. 16.09	2,078		
NEWPORT, Shropshire	S.H.M. Yeoman	Oct. 28	Nov. 30	691	Dec. 23	
			Dec. 2	389		
WYE, Kent	S.H.M. Yeoman	Oct. 29	Nov. 14.38	1,633	Dec. 5	
			Nov. 13.09	1,850		
PLUMPTON, Sussex	S.H.M. Yeoman	Oct. 29	Nov. 15.50	508	Dec. 10	
			Nov. 13.47	546		
SEALE-HAYNE, Devonshire	S.H.M. Yeoman	Oct. 31	Nov. 16.03	2,015	Dec. 10	
	Garton's No. 60		Nov. 15.22	2,315		
			Nov. 16.66	1,916		
SPROWSTON, Norfolk	S.H.M. Yeoman	Nov. 20	Dec. 18.19†	2,244	Jan. 8	
			Dec. 18.00†	2,155		
CARLISLE, Cumberland	S.H.M. Yeoman	Dec. 3	Jan. 3.72	1,087	Jan. 28	
	Wilhelmina		Jan. 4.09	1,076		
			Jan. 4.34	1,246		

* Squarehead's Master.

† Based on 16 instead of 32 observations per variety.

‡ Based on 30 instead of 32 observations.

NOTES FOR THE MONTH

Revision Course in Horticulture at Reading

A REVISION course in Horticulture will be held at the University of Reading from September 14 to 17, 1937, inclusive. The papers and discussions at the Conference will deal with Commercial Flower Production. The course has been arranged primarily for members of the horticultural staffs of counties, colleges and universities, but growers and other persons interested in the industry will be welcomed. The annual meeting of the Horticultural Education Association is to take place at Reading during the same week. Accommodation will be provided for members of the Conference in the University Halls of Residence from the evening of September 13 to the morning of September 18, at a cost of £15. per day for full board, including bed, breakfast, luncheon, tea, and dinner. The tuition fee for the course will be £2. Further particulars may be obtained on application to The Secretary, Agricultural Office, The University, Reading.

Prize Essays in Agricultural Economics

THE Agricultural Economics Society has decided to offer two annual prizes of £10 and £5 respectively for essays on subjects connected with the economics of agriculture. Competitors must be either students at recognized institutions or holders (of not more than two years' standing), of degrees and/or diplomas in agriculture and/or economics. Essays for the current year must be sent in by March 31, 1938, and must be on one of the following subjects:—

- (a) Social and economic changes in the position of farm workers during the last twenty years.
- (b) Sub-marginal land in Great Britain.
- (c) The nature and extent of changes in farm organization and technique since the War.
- (d) The influence of a more adequate and well-balanced dietary for all classes upon the character of British Agricultural Output.
- (e) Agricultural Tariffs and Quotas in Europe since 1924 —Their Growth and Objects.
- (f) Britain's security in time of war depends on home-production rather than on importation of food supplies.

PARISH BY-WAYS

P. E. GRAVES,

School of Agriculture, Cambridge.

BY-WAYS are a universal heritage, dear to the heart of poet and prose writer—and a curse to the man doomed to live on the spot! Wanderers venturing down these quiet tracks during the height of a dry summer have little idea of the conditions of these unmetalled roads—or “droves” as they are locally called—during the winter months, while the trials of the occupiers of isolated land are beyond their imagination. Although many droves are passable for motor traffic during the summer time, a heavy rain soon reduces them to a quagmire, and horses are the only sure means of transport for at least half the year. Even then, however, the going is often very difficult, as two horses can draw only a small load, and the strain on carts and harness makes carriage an expensive item when deprived of the advantage of good roads. Extracts from “The Story of the King’s Highway,” by S. and B. Webb, show that in the last century the condition of most roads was equally bad, and therefore the ownership of land on a public road was not considered an advantage, being more easily a prey to thieves. Those dark ages are past, and it seems unbelievable that despite the progress of communication in all other respects, these by-ways are practically in the same derelict state as they were a hundred years ago.

An interesting illustration, which the writer gives from personal knowledge of the parish, is that of Cottenham, one of the largest villages in Cambridgeshire, situated some six miles north of Cambridge, and covering an area of 7,224 acres. The river Ouse forms the northern boundary by which it is separated from the Isle of Ely, the parish lying between Willingham and Rampton on the one side, and Landbeach, Histon, and Impington on the other. Practically 70 per cent. of the land might be described as “fen,” and most of the bad roads are naturally associated with these parts of the parish.

Apart from some 905 acres enclosed in the reign of Queen Elizabeth, the open field system of land tenure persisted until 1842, the fenland being devoted to commons, while the open fields were situated on higher ground. One of the duties

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entrusted to those who carried out the work of enclosure in 1842 was to provide adequate roadways, with powers to alter or stop up any that existed previously. Little need be said of the latter, but the steps taken in this direction appear to have made the village more isolated. A public bridle-road and footpath leading to the Aldreth Causeway was done away with, and an outlet (for the land served by the private roads Nos. 17 to 19) to the public road to Rampton was also discontinued. In all, five such roads were closed, together with a large number of public footpaths.

The plan of Cottenham opposite shows the roadways laid out in 1846. The extent of what are termed "private" roads is considerable; indeed, out of a total of some $27\frac{1}{2}$ miles of roads no fewer than approximately 20 miles are designated as private. In addition to these roads there are, of course, numerous rights-of-way that have not been included on the plan. Although some of the roads are fairly near to one another, communication is often difficult owing to the presence of a network of dykes for the drainage of this area. These roads were probably laid out with the object of reducing the number of bridges to a minimum. During the course of almost a century, only two of the twenty-five private roads have become public highways—(1) part of Rooks Street (No. 20 on the map), about one-eighth of a mile in length, and now perhaps the most thickly populated part of the parish; and (2) Road No. 1, a little over 2 miles in length, leading to Twenty Pence Ferry. The former must have been taken over by the local authorities many years ago; the transference of the latter was only achieved in 1929. Although this recent development cost many thousands of pounds, it was considered that the volume of through traffic to the adjoining parishes would justify a grant from the Ministry of Transport, in consequence of which the contribution by the owners of some 740 acres of adjoining land was at the modest rate of 30s. per acre.

The Cottenham Award, 1842, provides that:—

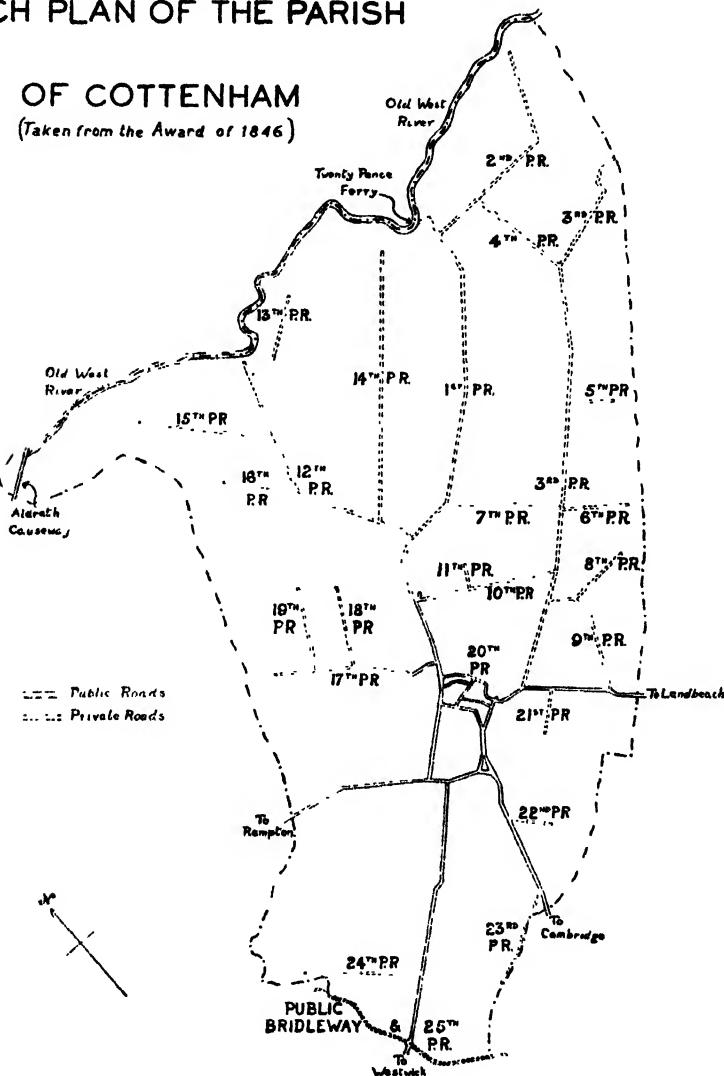
And we the said Commissioners do hereby direct that the private Roads hereinbefore set out and appointed pursuant to the said Act shall at all times hereafter be maintained and kept in repair by and at the expense of such of the Owners or Proprietors for the time being of any of the lands within the said Parish as shall for the time being use such Private Roads in the Shares and Proportions following (that is to say) each such Private Road requiring repair shall be divided across into three equal parts and all persons using such Road to an extent not greater than one of such divisions thereof in respect of such lands shall contribute

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one equal sixth part of such expenses. And all the persons using such Road to an extent greater than one but not greater than two of such divisions thereof in respect of such Lands shall contribute two equal

SKETCH PLAN OF THE PARISH

OF COTTENHAM (Taken from the Award of 1846)



Cottenham: Byways and Highways in 1846.

sixth parts of such expenses. And all persons using such Road to a greater extent than two such divisions thereof in respect of such Lands shall contribute three equal sixth parts of such expenses. And as between the persons respectively contributing to the said expenses in any one of the three classes hereinbefore mentioned the contribution (whether one

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sixth two sixths or three sixths) payable by such Class as aforesaid shall be assessed and paid by them by an equal Acre rate according to the number of Acres and so in proportion for any less quantity than an Acre in the Lands in respect of which such Roads shall be used by such Class. And that for the purpose of making such repairs in any of the said Roads any one or more person or persons using any such Road for the time being which may in his or their judgement require repair may convene a Meeting of the Parties using such Road by a Circular Letter addressed through the Post or otherwise to each of such persons specifying the time place and object of the Meeting and any two or more persons or the Majority of them if more than two of them assembled at such Meeting may resolve that such Road shall be repaired accordingly and may select one or more person or persons to superintend the repairs thereof accordingly and to assess in the manner and proportions hereinbefore mentioned the rate requisite for providing for the expenses of such repairs.

The provisions quoted show that the owners of the land concerned are entirely responsible for the state of these "droves" in that they are trustees of their holdings. The assumption that their attention or neglect is immaterial to the parish is erroneous, for it is a matter affecting the welfare of the whole community. Some of the older inhabitants of Cottenham can well remember how careful the farmers were in the past in trying to prevent deep ruts developing and water standing on the surface. A man was often employed cutting channels to the sides in order to drain away any surface water, and carters were warned of the importance of "quartering" the track so as to try and prevent the ruts getting deep. When a large hole developed a bundle of faggots would be put in to prevent the jolting of carts, this being removed in the spring when the surface was dry enough to harrow the road and scrape it level.

This careful administration was at a time when each parish was on a more or less self-supporting basis, and the necessity of good roads in order to make the best use of the land had nothing like the importance it assumes to-day. There is no doubt, however, that the reverse of this careful management has been going on for some years. It will be found that horses and carts keep to the same track until so many large holes develop that it becomes impassable, when another track will be tried to one side. It should be mentioned that some of these private roads are as much as 40 ft. wide. When the surface dries in the spring there is no liability as to who shall level these roads, and it is naturally left to the man with the most initiative, or perhaps to someone who wishes to do some carting. Many of the contrivances for the levelling of the surface would make worthy exhibits in a museum.

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Usually the form consists of a heavy harrow to which is attached one half of a cart tyre, with sufficient weight on top to keep it down. When this is drawn along each rut the harrow breaks up the surface, the tyre acting as a scraper, and, being semi-circular, guides the earth into the low places. Such tools are crude, but they can be very effective for their purpose. The introduction of tractors has led to a more efficient tool based on the lines of a road grader with the object of not only smoothing the surface, but also getting a "crown" to the road and thus allowing surface drainage. This levelling of the surface is simply a matter of routine on most of the roads; it takes but little time, and where no rates are levied several of the occupiers may give the man who does the job a few shillings for his trouble.

Evidence that our public roads received similar treatment in comparatively recent years, and that the type of tractor tool now used for levelling the surface is simply a revival of an ancient implement, is given in the writings of Albert Pell* who wrote in 1887 that:

People now living may have seen decaying under the walls of the parish church the enormous wooden plough, girt and stayed with iron, which, as spring approached, was annually furbished up and brought into the village street. For this, owners or their tenants, acting in concert, made up joint teams of six or eight powerful horses, and proceeded to the restoration of their highways, by ploughing them up, casting the furrows towards the centre, and then harrowing them down to a fairly level surface for the summer traffic.

It may perhaps be interesting to examine in closer detail one section of the parish where all the land is approached by means of droves. For this purpose the northern section, known as Smithey Fen and Setchell Common served by the five roads Nos. 12 to 16, is taken as an example. The area of the land amounts to some 1,630 acres, and at the time of enclosure (1842) it was held by 72 individual owners, the largest holding being 208 acres, while some holdings were less than one acre in extent. This represents an average of some 23 acres each, but since that date changes in ownership have amalgamated some of these holdings, and the area per owner to-day is in the region of 27 acres.

On the north-east extremity one property is traversed by the Aldreth Causeway. This was the ancient entrance to the Isle of Ely by land, but its purpose to-day only serves as a

* See *Journal of the Royal Agricultural Society* (Second series, Vol. 23, part 2, 1887).

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very neglected drove to occupiers of land in adjoining parishes. Apart from this, there are just under five miles of private road having only one outlet for vehicular traffic; this, be it noted, for a fertile area of land that is considerably greater than the whole of the adjoining parish of Rampton. The population is sparse, there being only eight cottages besides one attached to the pumping station. The bulk of this land only represents a part of the occupiers' total holdings; indeed, some have land scattered throughout the parish, and their concern as to road conditions is only relative to the area and type of land in their occupation. The presence of a few large landowners in the area probably accounts for the provisions of the Award having been carried out regularly for some years.

The damage done in consequence of only one year's neglect, however, cannot be made good in a hurry. In the past, the rates levied were 1s., 6d., and 3d. per acre, in accordance with the proportion of road used by the occupier. In practice this recognized system was felt to be unfair, because an occupier of a field rated at 3d. per acre might do more damage to the road by carting in wet weather than his neighbour with a self-contained holding farther on rated at 1s. per acre. In 1935 it was agreed that all should pay 1s. per acre, a progressive movement that ought to be reflected in road conditions in future. This, however, must depend on the continuity of a policy that can only be enforced so long as it complies with the law. The voluntary basis of contribution, however, coupled with the fact that all rates should now be levied on annual value and not on acreage, must constitute a serious menace. There can be no doubt that better roads in this area would lead to a greater development of the land, and react to the benefit of occupiers and to the whole district.

At present the position in Cottenham may be summarized by stating that there are some 17½ miles of private roads serving an area of approximately 4,200 acres of land. About half a mile of this compares favourably with some public roads; the remaining roads, however, are no more than dusty by-ways in summer and impassable mud tracks during winter. The land approached by 5 miles of these is now rated at 1s. per acre for the purpose of repairs and maintenance, while the remaining 12 miles are completely neglected, apart from the voluntary contributions of individual occupiers. If the example set by the former could be extended to all

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the private roads of the parish, a sum of no less than £200 per annum could be expended each year.

Judging by the condition of many droves in other parishes in this district it would seem that the attention they receive is very similar to that of Cottenham. For instance, the parish of Rampton, consisting of 1,372 acres, was provided in 1852 with seven private roads of 2 miles in length, and about 2½ miles of public road. The Award stipulates that these seven roads:

. . . shall be maintained and repaired by and at the expense of the proprietors and occupiers of Lands and Tenements in the said Parish and in such manner as the public roads within the same are by law liable to be supported and kept in repair.

Apart from the efforts of individual occupiers nothing appears to be done to the private roads in this parish.

The actual wording of Awards probably varies in each parish, but there can be little doubt as to the Commissioners' definite intentions for private roads to be kept in repair. Although the administration of the two parishes mentioned has been placed in the hands of occupiers, an isolated instance of public administration can be found in the parish of Swavesey. In this, the Award of 1840 stipulates that the various public and private roads:

. . . shall for ever hereafter be supported maintained and kept in repair by the Surveyor or Surveyors for the time being of the Highways within the said Parish of Swavesey by and at the expense of the Owners and Proprietors for the time being of the Lands and Grounds in Swavesey aforesaid by the said Act directed to be divided and allotted and the respective Tenants and Occupiers thereof in the same proportions as they contribute to the repair of the Public Roads.

These provisions have not been allowed to lapse, and every year a small committee headed by the clerk of the Parish Council decide the amount of money required, when accordingly the local authority levies a rate on approximately 3,400 acres of land. The amount collected has varied considerably between one year and another, but the influence that the consistent maintenance has exerted can easily be seen by contrasting the by-ways with those of other parishes; though probably the by-way rates would have ceased with the derating of agricultural land had it not been for the vigilance of those in authority. After careful deliberation during an interval of two years a regular system of collection is again in operation.

PARISH BY-WAYS

These cursory remarks cannot do more than ventilate a subject the importance of which is felt in many parishes throughout the country, and is undoubtedly worthy of an authoritative inquiry. Whether the acreage of derelict land is relatively high on private as compared with public roads is difficult to say, but there is no doubt that bad roads have a very detrimental effect on agriculture. It should not be forgotten that until 1929 the occupiers of remote farms paid local rates in spite of being penalized by isolation. The apathy of owners, the spasmodic efforts of a few, and the periodical discussions on these "droves" should be matters of past history. Several occupiers have expressed the opinion that all soft roads should be placed under one authority and administered in a similar fashion to those of Swavesey parish. Naturally, the provisions of many parish Awards become obsolete, and, in the course of time, complications by points of law add to the difficulties of administration. If reassessment by local authorities takes several years to determine as in the case of Swavesey, how much longer must it take for occupiers who are inexperienced in such matters? Certain it is that they should be offered some guidance. Agriculture can hardly be expected to make these droves up to the standard required for adoption by local councils, but regular attention would make them at least serviceable.

LAYOUT FOR A MODERN BULB BATH

M. H. TRIBE, M.A.(Cantab.), F.R.H.S.

OF the bulb growers who were able to attend the conference held in December, 1935, at Seale-Hayne College to discuss the Hot-Water Treatment of Narcissus Bulbs, many went home with their faith in the efficiency of their bulb baths shattered. The very informative papers read by Mr. Staniland and Mr. Barber of Seale-Hayne College, giving the results of their research work, showed very conclusively that the majority of existing bulb baths fall very far short of the standard of accuracy necessary for this work. It is sufficient here to state that an instrument was evolved for recording with a high degree of accuracy the temperature both of the water at various points in the bath and also of the interior of selected bulbs at any moment during treatment. With this instrument most of the principal sterilizing plants were given a thorough test, and the results were plotted in a series of curves. These results were in many instances an unpleasant shock to the owners. Quite frequently the ordinary bath thermometer was steady at 110° F., while bulbs in some parts of the bath never exceeded 108°, a temperature at which it takes four times as long to kill eelworm. There can be little doubt that most of the otherwise unaccountable cases of apparent reinfection of stocks after treatment can be traced to this cause.

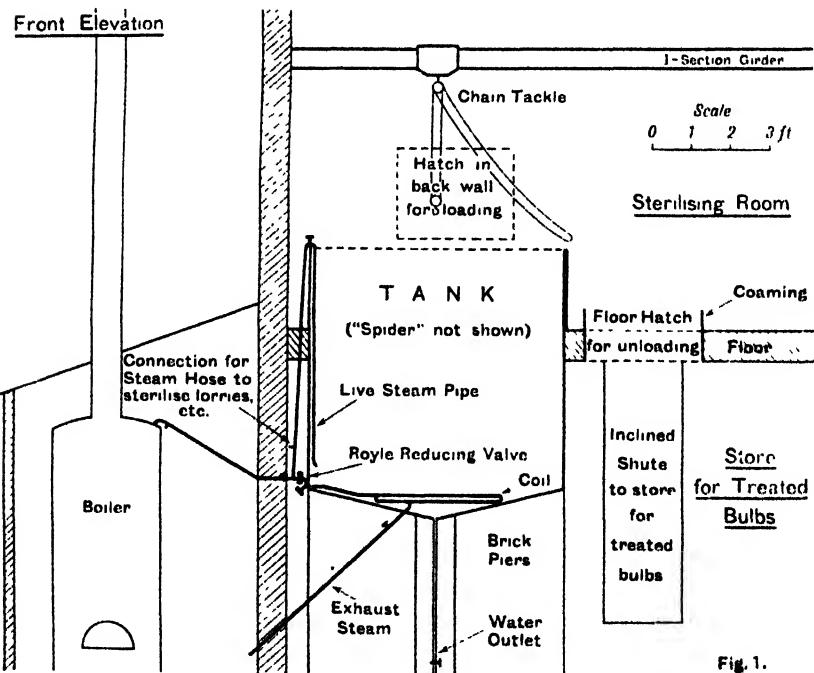
As considerable extensions were being made to the bulb store at the Buckland Flower Farm, the writer's property near Kingsbridge, it was decided to take the opportunity of installing a new bulb bath, laid out to give the maximum efficiency on the lines suggested by the latest research work. The plant is in itself very simple, but considerable thought has been given to the layout to secure absolutely efficient treatment and easy working, while eliminating all risk of reinfection.

An ordinary vertical cross-tube boiler is installed in a lean-to shed outside the walls of the bulb store. Steam at about 20 lb. pressure passes through a Royle reducing valve, which reduces the pressure to 5 lb., to a coil in the bottom of a large cylindrical tank, 6 ft. deep and 6½ ft. diameter. The tank

A MODERN BULB BATH

is supported on three brick piers, arranged radially, raising it so that, while most of it is in the ground floor of the bulb store, the top projects 2 ft. through the floor above, into a room reserved for sterilizing, the floor fitting tightly round the tank to prevent dust from getting through. There is also a pipe for injecting live steam into the tank for rapid heating up, the outlet being fitted tangentially in the bottom of the tank to help circulation by imparting a rotary motion to the water.

In the back wall of the sterilizing room is a hatch, through which the bulbs can be loaded straight into the tank from the store behind, where untreated bulbs are kept and loaded into containers. In the floor of the sterilizing room is another hatch, giving access to a shute down which the containers, after treatment, can be conveyed to the ground floor, which can be reserved for treated bulbs awaiting planting. This gives "one-way traffic" and reduces risk of reinfection. A 6-in. coaming is provided around the floor-hatch, to prevent dust being swept down. Boiler, pipes and tank are thickly lagged with asbestos to retain the heat, and, as regards the tank, to prevent uneven heating owing to



A MODERN BULB BATH

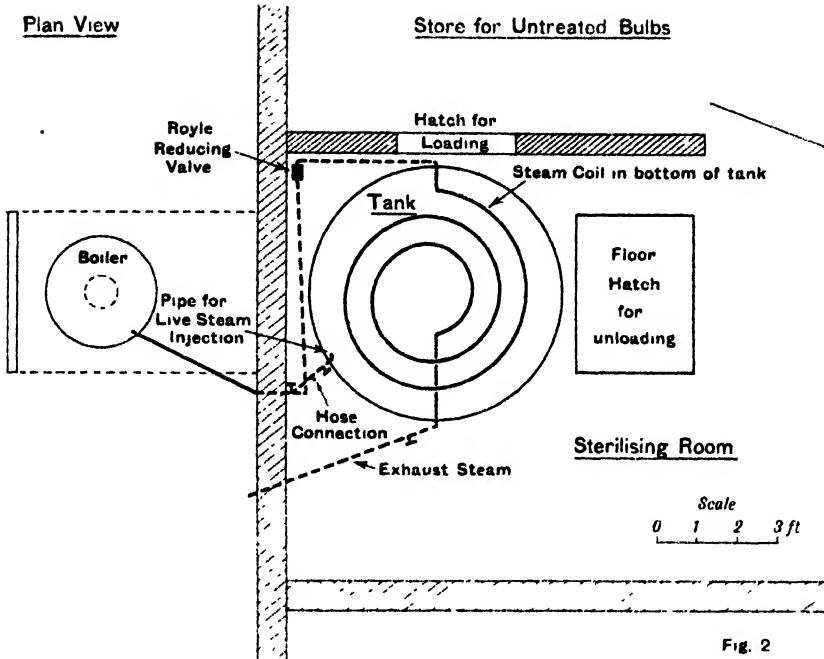


Fig. 2

draughts. A coating of cement is laid over the asbestos on the part of the tank projecting into the sterilizing room, to protect the asbestos from damage during the unloading of containers.

To facilitate loading and unloading, a "spider" or false bottom is provided. This merely consists of six radial arms of T-section iron, with the ends cranked over to make legs to raise the bottom of the crates a few inches clear of the coil. The framework is stiffened by a couple of concentric, flat iron rings. To the centre of the spider is attached a vertical spindle, with an eye at the top, level with the top of the tank. Into this eye can be fitted the hook of a differential chain tackle, carried on a traveller, which rides on an I-section girder fixed in the roof above the centre line of the tank and floor hatch. To prevent undue tilting of the spider when loading, three guides or hoops are fitted, connecting the top of the spindle with the outer ends of alternate arms of the spider. Owing to the buoyancy of the containers of bulbs, it is necessary to provide suitable weights to keep them under water: for this purpose three old iron fire-bars serve admirably.

A MODERN BULB BATH

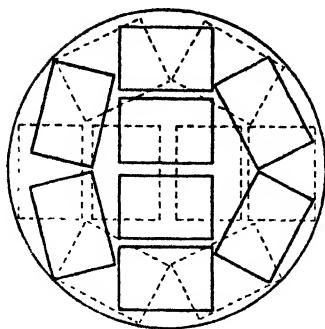
The containers are wooden crates, similar to lettuce crates, but lined with $\frac{5}{8}$ -in. wire netting. Their overall measurements are $21 \times 14 \times 14$ in. and each crate holds about 65 lb. of bulbs. Thirty-two crates go to each loading of the tank, so that nearly a ton of bulbs can be treated at a time. The crates are arranged in the tank in four layers of eight in the manner shown opposite. This allows free circulation of the water among the crates.

The method of operating the plant is to bring the water up to about 113° F. by injecting live steam. After cutting off the live steam, the coil is turned on and the spider is then hauled up to the top, the wall hatch opened and the crates of bulbs passed through and arranged in position on the spider, which can be rotated to facilitate this. As each layer of eight is completed, the spider is lowered slightly and after the last crate is in position the weights are arranged and the whole is lowered to the bottom. As soon as the loading is completed, the wall-hatch is closed. After treatment the process is reversed, except that this time the floor-hatch is open and the crates are swung on to the chute, from the foot of which a truck takes them away to be emptied into previously sterilized trays.

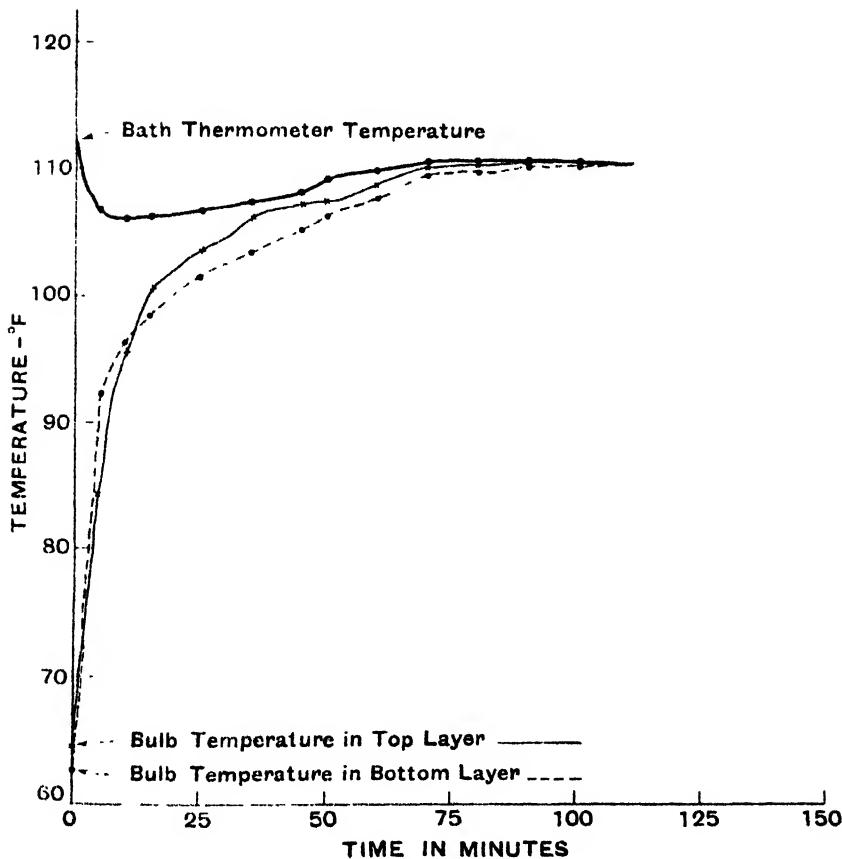
The capacity of the plant is unusually large, and provision is made for sterilizing the lorries that bring the bulbs to the farm by fitting a steam hose to the system.

The high efficiency of the plant, which is illustrated by the curve on p. II43, kindly plotted by Mr. Staniland from the results of his test, is attributed to the following factors: the use of (1) crates in place of bags, which restrict the circulation of the water; (2) a cylindrical tank, which gives much more even distribution of heat than a rectangular tank; (3) ample lagging of the tank and protection from draughts; and (4) a large volume of water in proportion to the quantity of bulbs (in this case about 1,000 gal. to a ton of bulbs), making it much easier to maintain a steady temperature. It will be noted that no pumps, propellers or thermostats are used, adequate circulation and accurate control being obtained without these complications. No difficulty is found in keeping the temperature steady within half a degree of 110° F. The curve shows that about an hour was taken for the temperature of the bulbs to reach 110° . In practice, it has been found quite safe to bring up the temperature rather more quickly.

A MODERN BULB BATH



Dotted lines show position of crates in 1st. and 3rd layers.
Continuous lines show position of crates in 2nd. and 4th. layers.



A MODERN BULB BATH

The points to be noted to avoid re-infection are:—

(1) Rigorous segregation of treated from untreated bulbs, and strict enforcement of one-way traffic through the plant.

(2) Precautions such as the hatch coaming to prevent dust spreading disease.

(3) Sterilization of all trays, other receptacles and vehicles used for treated bulbs.

Formaldehyde is used to control fungus attacks and to reduce the time necessary to kill eelworm "wool" at 110° F.

FRUIT TREE SPRAYING IN 1936

J. TURNBULL,
Ministry of Agriculture and Fisheries.

A DEMONSTRATION in the Wisbech area in 1936 showed what can be done to obtain better results from existing spraying tackle, by substituting short lances and double nozzles, (giving a fine driving spray of long range) for the long lances formerly in general use. This demonstration was described in this JOURNAL for December last (pp. 846-854). Progressive fruitgrowers in many parts of the country, however, who have not been afraid to invest large sums in new spraying machinery, have advanced considerably beyond that. They are obtaining better results with greater certainty than was ever possible by the older methods, and are producing a high proportion of Extra Fancy apples. It is true that their capital outlay on machinery has been heavy, but even after making adequate allowance for interest and repayment of capital, there is a substantial reduction in annual expenditure.

Unfortunately, few fruitgrowers keep detailed accounts and records of their spraying. More would do so if they realized how much it would help them to improve their programmes and cut down expenditure. It was entirely owing to the detailed observations needed to arrive at the cost of spraying that the recent advances made in spraying have been attained. It is generally possible to ascertain the total quantities of each kind of material used on a farm, and sometimes the wages paid for spraying, but it is seldom possible to obtain the quantities used in each plantation for each spray. Detailed accounts cannot be prepared from such information if there is much variation, either in the plantations or in the spray programme used on different parts of the farm. Fortunately it has been possible to find several farms on which the trees and programme are fairly uniform, and which are in the possession of fruitgrowers able and kind enough to supply sufficient particulars.

The costs given below cover average bush trees and exceptionally large half-standards, sprayed by means of a central plant, and average half-standards sprayed by means of a large portable pumping outfit and portable pipes. It has also been possible to include some costs incurred while using the latest type of American spraying machinery. In every instance the costs are based on the spraying of 50 acres or

FRUIT TREE SPRAYING

more of bearing apple trees, but in order that they may be applied to any acreage they are shown on a "per acre" basis, and the prices of spraying materials shown are not the prices that were actually paid but the prices at which any farmer can buy the materials now. The quantities of diluted wash are worked out from the quantities of material and the strengths at which they were used. They have all been corroborated by the total amount pumped in a day and sometimes cross-checked by the quantities of accessory materials (e.g., "wetting agents") that were used. With lime-sulphur there is usually a variation in the quantities used at different stages of growth, but in the absence of detailed records it has only been possible to give an average figure for each spraying.

Bush Apples. Mr. W. Lawrence Taylor's farm at Galleywood, Chelmsford, consists mainly of bush apple trees. There are some plums and some young non-bearing trees which it has been possible to eliminate from the costs. The trees taken into account are all in bearing, one-third old trees and two-thirds between eight and twelve years old. A few of these are half standards, but the proportion is so low that they are disregarded.

Mr. Taylor was sceptical of the statement that from one-third to one-half of the men's spraying time was spent in moving portable pipes, and in 1935 he kept a record. He found that the total wages paid for moving the pipes and plant during the season amounted to £1 per acre. He decided to instal a central plant, with underground main and lateral pipes, and to spare no expense that seemed justified.

Rails were erected about 6 ft. above ground level outside the pumping station, which would hold sufficient barrels of material for a day's work, and along which the barrels could be rolled into the house and emptied into a receptacle, leading to a graduated measuring tank. Thence the material passes when required into one of two large spraying tanks, suspended in an excavated chamber (which permits ready access to any part of the tanks). Water is laid on and is run into these tanks through large strainers, in which substances, such as arsenate of lead, can be placed and washed in. The pump itself is double the size considered necessary at the moment, and is driven at half speed by means of an electric motor, geared directly to it. The working pressure is 400

FRUIT TREE SPRAYING

to 450 lb. per sq. in. and can be much increased, if found desirable. No lateral pipes are used with a diameter of less than 1 in., in order to avoid loss of pressure. Clear water is always pumped through the pipes for half an hour after spraying, to avoid sedimentation. A larger number of stand-pipes than usual has been put in (averaging 3½ to the acre), in order to avoid the need for dragging the hoses diagonally through the trees, which, though satisfactory for half standards, is apt to lead to confusion in spraying the more closely-planted bush trees.

The total cost of this plant, allowing for all machinery and piping, labour for trenching in pipes, adaptation of building, etc., was heavy and amounted to £18 per acre, but who shall say it is not justified by results? Mr. Taylor is in a position to spray every apple tree on the farm in 3½ days with tar oil, or in 2 days with later sprays. If the pump were speeded up and more men set to work, the whole could be sprayed in one day. This enables the very best moment for any spray to be chosen, so that it will have the maximum effect. The total number of days' spraying needed for the whole season's programme with this plant in 1936 was 12, whereas with a small plant in 1935 it took 85.

In order to arrive at the cost of running such a plant it is essential to consider interest and repayment of capital. If the money had been borrowed under the Lands Improvement Act it could have been repaid with interest at 3½ per cent. plus tax in 15 years by annual payments, equivalent to £1 12s. 6d. per acre. This appears to be a suitable basis, though the plant will obviously last much longer than that. The cost of current used by the motor in 1936 was 8½d. per acre. No repairs should be required in 15 years, beyond annual attention to the valves and plungers and occasional repainting of the tanks. This will amount to less than 2s. per acre per annum; 120-ft. rubber hoses, fitted with 2-ft. wooden handled lances and double nozzles cost £1 per acre, and if they only last 5 years this would amount to 4s. per acre per annum. The total cost of the plant, therefore, amounts to about £2 per acre per annum.

The spray programme consisted of tar oil at 6 per cent., 2 pre-blossom lime-sulphurs at 2½ per cent. (the first with arsenate of lead at 4 lb. per 100 gal.), and 2 post-blossom lime-sulphurs at 1 in 150 (the first with arsenate at 4 lb., nicotine at 8 oz., and spreader at 4 oz. per 100 gal., the second with

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arsenate only). The double nozzles are of the design published in this JOURNAL for August, 1934, p. 433, but with a swirl plate modified by the omission of the central hole, it having been found that the finer spray this gives will carry far enough at these higher pressures. Size No. 4½ discs (.070 in.) were used, giving each double nozzle an output of 3 gal. per min. at 400 lb. pressure. Larger discs and 4 ft. lances were used for the half-standards. Each man sprayed 2·45 acres per day with tar oil and 4·15 acres with lime-sulphur, etc. Quantities and costs are given later.

Half-Standards. Mr. H. H. Tompsett of Marden, Kent, has grass orchards consisting almost entirely of half-standard apple trees standing 24 ft. apart. Some orchards are overlapping, some have average and some small trees. The quantities of tar oil used in each orchard in 1934 show that the small trees nearly make up for the very thick trees, and the whole, therefore, can very fairly be regarded as average.

The present plant consists of a high-powered portable outfit, capable of maintaining a pressure at the pump of 450 lb. per sq. in., and a set of portable pipes fitted with flexible couplings. The portable pipes are being scrapped and replaced by underground mains and laterals this winter. The total cost of the portable outfit and portable pipes amounted to £6 per acre. Allowing a life of ten years, the interest and repayment of capital is 15s. per acre. Repairs and replacement of flexible couplings will amount to about 3s. 6d. per acre per annum. Hoses 120 ft. long, fitted with 4-ft. lances and double nozzles cost about 12s. 6d. per acre, and allowing a life of 5 years the annual cost will be 2s. 6d. per acre. Petrol for the season's spraying amounts to about 4s. 4d. per acre. The total cost of this plant, therefore, works out at about £1 5s. 4d. per acre per annum.

The programme consisted of tar oil at 7½ per cent., a green flower lime-sulphur at 3 per cent. with arsenate at 4 lb. and spreader at 4 oz. per 100 gal., a pink bud lime-sulphur at 2½ per cent. with spreader (except on Lord Derby and some odd sorts), one post-blossom lime-sulphur at 1½ per cent. with spreader on all varieties, and a late post-blossom lime-sulphur at 1½ per cent. with spreader on some varieties only. The quantities used in 1936 cannot be ascertained, but Mr. Tompsett kindly supplied particulars for some sprayings in 1934 and 1935 from his records.

The spraying on this farm is of particular interest, because

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it is the only farm known to the writer on which the summer sprayings are done by the piece. Realizing that a man cannot work any faster than the nozzle output will allow him, permission was given to use larger discs, so long as material was not wasted. The price paid was 3s. per acre, including both the spraying and moving, but not including the foreman, who mixed the wash and minded the engine. Mr. Tompsett is satisfied that no waste of wash occurred and that the results are even better than in previous years.

Very Large Trees. Mr. A. J. Wooldridge's farm at West Peckham, Maidstone, presents almost as difficult conditions for spraying as it is possible to find. About two-thirds of the acreage consists of Bramleys, which are exceptionally large trees, standing 40 ft. apart and the majority touching each other. The remaining one-third consists mainly of very large spur-pruned Lord Derby, with a few more closely planted Lanes, etc. The farm has been heavily manured in the past and all the trees are much above normal size.

Mr. Wooldridge took over the farm in March, 1935, and found he was unable to control scab and capsid with the existing spraying plant. He installed a central spraying plant, with underground main and lateral pipes, in the winter of 1935-36. It is of the normal type, of which many have been installed in Kent during the last few years. The pump has a sufficient capacity to enable all the apple trees on the farm to be given the heavy spraying, which such large trees require, in 4 days. It is driven by a Diesel engine and a pressure at the pump of 450 lb. per sq. in. is maintained, though more can be had if necessary. Measuring, mixing and spraying tanks are installed outside the pump house (on account of the danger of poisoning when nicotine is handled in an enclosed space). The wash is pumped through underground mains and $\frac{1}{4}$ -in. laterals. It is contended that possible loss of pressure in these smaller pipes is counterbalanced by a reduced risk of sedimentation. The number of stand-pipes averages $1\frac{1}{2}$ to the acre. The cost of this plant amounted to £10 per acre, to which must be added the cost of labour for trenching in the pipes, estimated in this case to amount to 30s. per acre. The total cost was thus £11 10s. per acre.

The annual cost of the plant for interest and repayment of capital in 15 years is £1 os. 10d. per acre. The cost of Diesel oil used in 1936 came to 11d. per acre. Repairs should not exceed 2s. per acre per annum. Rubber hoses each 120 ft.

FRUIT TREE SPRAYING

long, fitted with 4-ft. lances and double nozzles, cost 12s. 6d. per acre, and this on a 5-year basis costs 2s. 6d. per acre per annum. The total annual cost of this plant, therefore, amounts to approximately £1 6s. 6d. per acre per annum. The Bramleys were sprayed with tar oil at 6 per cent., except one piece that had not been sprayed with tar oil before at 8 per cent., and this last piece received petroleum at 7½ per cent. later. Lord Derby and the others had partly tar-petroleum emulsion at 7 per cent. and partly miscible tar-petroleum at 6 per cent. All had 3 pre-blossom lime-sulphurs at 2½ per cent. with spreader at 5 oz. per 100 gal. All had one post-blossom lime-sulphur at 1 per cent. with spreader, some with arsenate at 4 lb. and some with nicotine at 8 oz. per 100 gal. The Bramleys had another lime-sulphur at 1 per cent. with spreader. Single adjustable nozzles were used for most of the tar oil, but a change was made to double nozzles, which were used for all subsequent sprays. The double nozzles were fitted with the 7-hole swirl plates (i.e., those including the central hole) and No. 5 (0·077-in.) discs, giving an output of 3 gal. per min. Each man sprayed approximately 26 acres per day with lime-sulphur.

Quantities and Costs. These are grouped together here for the purposes of comparison. The quantities, given in gallons of diluted wash, used to spray an acre of trees at pressures of 350 to 450 lb. per sq. in., give an idea of the effect on cost of trees of different size and thickness and are as shown in Table I.

TABLE I

Trees	Nozzles	Tar oil	Mixed tar-petroleum	Petroleum	Lime-sulphur, etc.
Bush—Average size	Double	440	—	—	255
Half-Standard :					
Small	Single	323	—	—	200A—216B
Average	"	408	—	—	235A—180B
"	Double	327	—	—	—
Very thick	Single	593	—	—	400A—255B
"	Double	540D	—	—	—
40-ft. Bramley..	Mostly single	738	—	—	
Not quite so big, spur-pruned ..	Double	—	820C	—	
Very large, not sprayed before	Single	1000	—	388	
Cherries—Very tall ..	"	667	—	—	—

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NOTE.—A. Green-bud stage, intended to be sprayed thoroughly.
B. Post-blossom, intended to be sprayed lightly. C. Part sprayed with tar-petroleum of emulsion type (808 gal. per acre) and part with similar wash of miscible type (832 gal. per acre); average 820 gal. per acre.
D. Sprayed in very windy conditions.

It will be seen that there is little difference in the quantities per acre required by bush and half-standard apple trees, when they are of average size and density. If half-standards are very large, or very thick (overlapping), the quantity is 50 per cent. greater, or even more. This probably applies to bush trees as well. It is well known how trees that have not been sprayed with tar oil before seem to absorb this wash, and this is shown by the very high figure. It is curious that the very tall cherries took slightly less than the very large and rather dense, though not so tall, Bramleys. Probably the latter had more wood in them. The comparative figures for adjustable single and fixed double nozzles with the right type of spray were obtained in consecutive seasons in the same orchards. It will be observed that the saving was 20 per cent. on average trees and only 9 per cent. on very dense trees, but with the latter the conditions were very windy when the doubles were being used. Unfortunately the figures do not throw much light on the vexed question of the comparative costs of applying tar oil and petroleum as two separate sprays, or as one mixed spray. The trees that received the separate sprays were larger and were sprayed with nozzles that use more wash. It is rather remarkable that, even with these disadvantages, they did not need so much tar oil as the smaller trees needed of the mixed oils. The emulsion and miscible oils both needed the same quantity, which is not usual and is probably accounted for by the make-up of the oils. It needed less than half the quantity of petroleum (following tar oil) that it did of either mixed oil, in spite of the fact that the former trees were larger. This is in accordance with general experience, though it is by no means generally realized. The quantity of lime-sulphur varies appreciably at different stages of growth, but the average is about 55 per cent. of the quantity of tar oil needed for the same trees. On two of the farms the post-blossom lime-sulphurs were applied thoroughly, but at weaker strengths. On the other farm they were applied lightly at greater strengths.

The total costs per acre of carrying out the different programmes, under the different conditions and with the different machinery described, and charging the materials

FRUIT TREE SPRAYING

at current prices, instead of actual cost, were as shown in Table II.

TABLE II

	Average bush trees, central plant	Average half- standards, portable plant, piecework	Very large trees, heavy programme, central plant
Tar oil, mixed oil and petro- leum ..	£1 12 1	£1 17 7	£3 7 11
Lime-sulphur ..	16 6	1 1 0	1 13 6
Spreader ..	1 5	6 2	12 5
Arsenate ..	14 3	4 7	3 1
Nicotine ..	10 0	—	8 0
 MATERIAL ..	£3 14 3	£3 9 4	£6 4 11
LABOUR ..	10 11	1 4 0	1 1 10
PLANT ..	2 0 0	1 5 4	1 6 6
 TOTAL	£6 5 2	£5 18 8	£8 13 3

These costs show a substantial reduction on what was considered possible a few years ago, and it is now beyond dispute that the work has been done with less trouble and with far better results. This is not the place to discuss the technical aspects of the spray programmes used, but in order to avoid misunderstanding it is desirable to mention that on certain parts of certain orchards, consisting of highly manured Bramleys, a small proportion of the apples was attacked by late scab. This need not have occurred. In the writer's opinion, varieties subject to late scab should always be given a weak spray of lime-sulphur about the middle of July, when conditions of manuring or rainfall are such as to favour development of the disease.

American Methods. Messrs. R. and B. Dixon have an extensive acreage of fruit at Teynham. A large proportion consists of cherry orchards, which require spraying with arsenate of lead at the same time as the pink-bud and petal-fall sprays have to be applied to apples. In order to be able to complete all of this work at the right time, they acquired, in March last, in addition to their central spraying plant, one of the latest type of American spraying outfits. As they do not use it in the same manner as in the U.S.A., and as they have only used it for part of a season, it is impossible to present the costs in a manner comparable with the others, but such experience as has been gained with it is of interest.

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The outfit presents somewhat the appearance of a motor car. Behind the radiator and under the bonnet are placed an 8 h.p. petrol engine, and behind that a high-speed pump and pressure regulator. Behind that again is an almost cube-shaped tank, holding 250 Imperial gallons, through which passes the axle holding the rear wheels. The special feature of this outfit is its very light weight, the engine, pump and pressure regulator together weighing only $4\frac{1}{2}$ cwt. The complete outfit, fitted with rubber tyres, costs £295. It is drawn up and down the rows by tractor, which must be available when this method is used. Water has now been made available at a number of stand-pipes, and a portable 500 gal. tank is filling up at one of these while spraying is in progress.

The annual cost of interest and repayment of capital, allowing a life of 5 years, is £67. Repairs should not exceed £5 per annum, making £72 in all. Petrol costs 3s. and tractor 18s. per day. Mr. Dixon reckons his tractor costs at 1s. 6d. per hour, but the more usual figure of 2s. per hour has been taken. Assuming 24 days' work in a season, these two items amount to £25 4s. Hoses and lances are included in the original cost and should last 5 years, so that no special charge is made for them. The total annual cost thus amounts to £97 4s. The annual cost per acre depends upon the number of acres sprayed. In this instance, owing to the small quantities of wash used, it covers 54 acres for the season, and the annual charge amounts to £1 16s. per acre.

When spraying, one man drives the tractor and two men spray. Both ride on the outfit. Each uses a 4-nozzle lance and the total output is 12 to 16 gal. per min., at a pressure *at the nozzle* of 500 lb. per sq. in. This method is found more effective than one man using an 8-nozzle lance. A point of particular interest to the writer is that the type of spray employed is almost identical with that evolved independently by him, modified to suit the higher working pressure. Another feature is the instantaneous cut-off provided on the lances. This works very easily and is estimated to save 25 per cent. of material.

Mr. S. R. Dixon, who supervises the spraying and keeps detailed records of it, has kindly supplied the information given in Table III.

The table shows that the average quantity used for each spraying amounted to 114 gal. and the wages (3 men at 2s. 6d. per hr.) to 1s. $7\frac{1}{2}$ d. per acre—a very low figure, to

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TABLE III

Spray	Trees	Age: Years	Acres	Gal.	Time for 3 men (hours)	Gal. per acre
Pet. emul. . . Lime-sul. (1st)	Apples, h.-standard	17	3 $\frac{1}{4}$	530	3	142
	Pears, standard . .	25A	5	750	4 $\frac{1}{2}$	150
	" dwarf . .	10B	3	500	2 $\frac{1}{2}$	166
	" standard . .	26C	2	600	1 $\frac{1}{2}$	300
	Apples . . .	D	15	1400	9	94
	" and pears . .	15& 30E	17	1500	12	90
	" (2nd)	Pears, standard . .	A	5	700	6 $\frac{1}{2}$
		" dwarf . .	B	5	850	3 $\frac{1}{2}$
		" standard . .	C	1	250	2 $\frac{1}{2}$
		Apples . . .	D	15	1400	7 $\frac{1}{2}$
		" and pears . .	E	23	2500	13 $\frac{1}{2}$
Arsenate . .	Cherries . . .	15	6	250	1	42
	" . . .	30	13	1820	9	140
TOTALS . . .			114	13050	74	—

NOTE—The letters indicate orchards that were the same for each spray, though all the trees may not have been sprayed both times.

which reference will be made later. It will also be seen that the average quantity of spray used was 176 gal. per hr., although the actual output at the nozzles was 12 or 16 gal. per min. Too much time was taken up when not spraying, but various improvements in the arrangements for obtaining water, etc., have been made, and should lead to better results in future.

It is difficult to arrive at the total annual cost per acre of spraying apples, but on the assumption that half the normal quantity of material was used on each occasion, it was approximately as follows:—

MATERIAL	..	..	..	£	s.	d.
LABOUR . .	..	..	..	0	11	5
PLANT . .	..	..	..	1	16	0
<hr/>				<hr/>		
TOTAL . . .				£4	7	5

The total cost is far below that of the other methods, but reflection will show that this is entirely due to the very small quantity of wash used.

It has been found possible with this outfit to average nearly 14 acres per day, using about 114 gal. per acre. If the normal quantity of 250 gal. per acre were applied, it would

FRUIT TREE SPRAYING

be necessary to use an outfit of double this capacity for this acreage, and, allowing a life of 5 years, the annual cost would be very high. It follows, therefore, that the crux of the matter is whether this very light spraying gives a good enough control of pests and diseases. All that can be said at present is that Mr. Dixon is satisfied with the results. Any new method, however, requires trying out in several different kinds of seasons and under different conditions, before it can be considered to have proved itself. In view of the initial results, future performance will be followed with great interest.

Observations. The problem of how to carry out the heavy spraying programme, now required for producing high quality apples and pears on bush and half-standard trees in full bearing, by means of the labour staff usually to be found on fruit farms and quickly enough to be effective, has now been solved by the provision of improved equipment. The capital cost of this equipment is heavy, but the annual expenditure has been substantially reduced. Taking as a standard the need for spraying all the apple trees on a farm in 4 days at the pink-bud and petal-fall stages, the capital cost of the different systems can be stated. It is approximately £12 per acre for a central plant with underground pipes, although considerably more has been spent on one particular orchard. It is about £6 to £8 per acre for either a portable plant with portable pipes, or the American mobile system, but this figure does not include the cost of laying on water to each plantation, which will often amount to £2 per acre, nor does it include any part of the cost of the tractor, which is required in the latter case. The merits of the different systems are a matter for debate, but the writer has no hesitation in expressing his own opinion. The mobile system is invaluable for dealing with young plantations, where there is a relatively long way to go from one tree to the next and with old orchards consisting of very tall trees, when it is an advantage for the sprayman to be standing on top of the outfit. For profitable orchards and plantations of bearing trees, however, the extra cost of underground pipes (partly paid for by the smaller plant needed) appears to be thoroughly justified by the extreme simplicity of working the system and consequent freedom from mistakes.

If the annual costs are compared with 5 years ago it will be seen that there is a substantial reduction. Taking an

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average programme, the cost of material is 25 per cent. lower. The cost of labour is from 50 to 75 per cent. lower, according to the kind of plant installed. The capital outlay on plant is greater, but taking the annual cost of this together with labour the combined cost is still lower than it was. In spite of this saving in expenditure the results are infinitely better. As regards the very large trees quoted, it was impossible to obtain good control of pests and diseases with the machinery available 5 years ago, but it is done to-day.

The quantities of wash now found necessary are less than those used 5 years ago by fruitgrowers who did actually control pests and diseases. Some fruitgrowers may dispute this, but the fact is that either they do not know what quantity they use, or they are not obtaining control. The average quantity of lime-sulphur used—250 gal. per acre on average trees—is in fact a small quantity, and this is due to the type of spray used. Dr. T. Swarbrick, of Long Ashton Research Station, considers this quantity inadequate, but it should be pointed out that his spraying must be carried out under exceptionally windy conditions, and that such conditions necessitate the use of a coarser type of spray (such as is given by a gun) so as to obtain greater wind resistance. In such conditions it is obvious that a larger quantity of wash will be required and a larger plant will be needed for the same acreage.

The reduction in the amount of labour has been brought about by the use of larger nozzle outputs, the effect of which was first demonstrated on a large scale at the Commercial Fruit Spraying Demonstration carried out at West Farleigh, nr. Maidstone, in 1932, and described in the 1932 edition of the Ministry's Bulletin No. 5. The actual output of the double nozzles used on the farms quoted was approximately 3 gal. per min. Larger outputs are in use on some farms for half-standards, but detailed costs are not available. The output of the multi-nozzle lances used with the American machine vary from 6 to 16 gal. per min., but the men ride on the machine. The use of a large nozzle output is important, because, combined with the use of a plant large enough to supply them, it brings the carrying out of an extensive spray programme within the powers of the number of men available on the farm.

Sufficient information is available to show the number of men and capacity of spraying plant needed to obtain satis-

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factory results under varying conditions, when these methods are used. The most critical times for spraying apples are at the pink-bud and petal-fall stages, and it is now generally agreed that it must be possible to spray all the apple trees on the farm at these stages in 4 days. Bearing in mind that each sprayman can cover $2\frac{1}{2}$ acres with a portable plant and 4 acres with a central plant in a day, when using a nozzle output of 3 gal. per min., and allowing one man for mixing, Table IV shows the acreage of fully grown trees that can be sprayed in 4 days by the different methods:—

TABLE IV

No. of men	Pump capacity. Gal. per hr.	Engine h.p.	Portable plant, portable pipes. Acres.	Central plant, underground pipes. Acres.
2	240	2	10	16
3	480	4	20	32
4	720	6	30	48
5	960	8	40	64
6	1,200	10	50	80
8	1,680	14	—	112
10	2,160	18	—	144

NOTES.—When dealing with large-size portable plants it is impossible for one man to do the mixing, unless suitable means for handling the barrels and water are available. Further, unless water is laid on, an extra man will be needed for carting water. If all the trees on the farm are very large or very thick, or if a heavier type of spray is used, the pump capacity may need to be 50 per cent. greater.

The difference between the quantity sprayed by means of portable and central plants is due to the amount of time wasted in moving portable pipes. If a longer period than four days could be allowed without prejudicing results, the acreage that could be sprayed by any machine would be correspondingly increased. If, on the other hand, it is thought desirable to be able to finish one spraying in two days, the cost of the plant will be increased, and the number of men required will be one to 7 acres.

No satisfactory costs of the American system (i.e., with men riding on a travelling machine) are available at the moment. The chief difficulty with this system is the time wasted in filling up the machine, when the tank is empty. This can, however, be made up by the very large nozzle output that a man can use, when riding. There does not appear to be any limit to this, other than the limit of the weight of the necessary amount of machinery and spray liquid which must be carried to make the use of a very large pump worth while.

THE CHRYSANTHEMUM MIDGE*

THE Chrysanthemum Midge has been known since 1915 as a serious pest of greenhouse chrysanthemums in North America, and it has been found attacking these plants on three occasions in Europe—twice in England and once in Denmark. In England the outbreaks, which were discovered in 1927 and 1936 respectively, were traced to chrysanthemum varieties imported from the United States: the origin of that in Denmark, which occurred in 1934 in two nurseries near Copenhagen, is not definitely known, but it is probable that in this instance also the pest was brought in with imported plants.

When the Midge was first discovered in America it was recorded under the name of a European species,† known since 1885 as attacking the roots of various kinds of Ox-Eye Daisy. This original identification, however, seems to have been accepted in Europe without further investigation and without experimental evidence to show whether the daisy midge will in fact attack greenhouse chrysanthemums. In view of the difference in habit between the two insects, it is not improbable that they may prove to be distinct species. However this may be, it is clear that from the horticultural point of view the Chrysanthemum Midge must be regarded as a foreign pest, and since its establishment in this country would add greatly to the cost of growing chrysanthemums, it is most desirable that this should be prevented from happening. The Ministry of Agriculture and Fisheries has power to deal with outbreaks under the Destructive Insects and Pests Order of 1933, and growers are requested to inform the Ministry if they notice on their plants any of the symptoms described below.

The injury caused by the Chrysanthemum Midge is due to the feeding of the larvae within the tissues of the plant, as a result of which conspicuous cone-shaped galls are produced. Where the infestation is slight, these galls are found only on the leaves (Fig. 2), mainly on the upper surface, but also occasionally on the underside. In severe attacks, however,

* *Diarthronomyia* sp.

† *Diarthronomyia hypogaea*, F. Löw.

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the stems, buds, and developing flowers are also affected (Fig. 3), giving rise to severe distortion and stunting of the plants. The flowers will be poor in quality and reduced in numbers, and little or no growth for cuttings will be produced. Galled cuttings do not root readily, and in any event produce weakly plants.

The adult midge (Fig. 1) is a very small reddish-yellow fly, not more than $\frac{1}{10}$ in. in length, with long legs and antennae. The flies usually emerge from the pupae in the very early hours of the morning, between midnight and 5 a.m. Pairing takes place almost immediately, and egg-laying, on warm days, is completed by mid-day, though in colder conditions it may be more protracted. The males die soon after pairing and the females shortly after egg-laying: the adult life is thus very short, occupying only one, or at most two days.

The eggs are exceedingly small, being practically invisible to the naked eye. They are oval in shape and of a reddish-orange colour: 80-150 are laid by each female. They are deposited in groups on the growing parts of the plants, usually on the small hairs on newly-developing leaves. In from four to twelve days the eggs hatch, giving rise to minute whitish larvae or grubs. Soon after hatching, these grubs, which are legless and oval in shape, burrow into the tissues of the plant, where they feed, causing the characteristic galls to appear. The galls, which are at first indicated by a lighter patch on the leaf surface, show distinctly about ten days after the grub has entered the tissues. The length of the larval stage varies with the time of the year: in early spring and autumn, three to four weeks is the usual period, but development is much slower in summer and winter. When full-fed the grubs change to oval brownish puparia in the galls, where they remain quiescent for about ten days. At the end of this period the pupa pushes itself half way outside the gall and the adult emerges.

Breeding goes on continuously during the year, but is greatly retarded in summer and in winter, when the larval stage is protracted. The chief periods of activity are in early spring, when cuttings are being taken and rooted, and in autumn when the flowers are developing. During these two periods the infestation increases very rapidly, and unless checked will cause serious loss of cuttings and of marketable blooms.

In America, where the pest has become established over

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a wide area, routine control measures against the midge have had to be adopted by a large number of chrysanthemum growers in order to obtain healthy cuttings and marketable blooms. As the plant tissues largely protect the larval and pupal stages from the action of insecticides, control measures have been mainly directed against the adults and eggs. Both of these are susceptible to the action of nicotine, and the former also to that of hydrocyanic acid gas, but whichever stage is dealt with treatment must be frequent and thorough. To kill the adults before eggs have been laid fumigation must be carried out each night throughout the active seasons of the midge: for this purpose either hydrocyanic acid gas or nicotine is suitable, but measures against the egg stage are those most frequently employed. A suitable spray consists of nicotine 95-98 per cent. at a strength of 1 part to 800 parts of water (i.e., 2 oz. per 10 gal.) with the addition of sufficient soft soap or other spreader. As the eggs may hatch four days after deposition, spraying must be carried out twice a week during the periods of maximum activity of the midge, that is to say for a period of six to eight weeks in spring and a similar period in autumn. Considerable expense both in labour and material is thus involved.

In this country, where the Midge has not yet become established, it is necessary to employ more drastic methods in the hope of eradicating it altogether. The precise measures to be adopted in any given instance are stated in the Notice under the Destructive Insects and Pests Order of 1933 that is served on the owner or occupier of the affected nursery, but their general nature is as follows:

A. In Nurseries where the Ordinary Commercial Varieties are grown for the Flower :—

1. All galled leaves must be removed and burnt.
2. No flowers showing galls on the leaves or stems may be marketed.
3. After flowering all plants must be destroyed by fire. No cuttings shall be taken, and after all plant refuse has been removed the houses must be left vacant for a period of at least 14 days.

B. In Nurseries where New or Valuable Varieties are grown :—

In addition to the methods under 1 and 2 above

3. Spraying with a nicotine wash (as indicated previously) shall be carried out twice a week in spring and autumn.
4. After flowering, all tops must be cut down and burnt. Cuttings shall not be taken from heavily infested plants, and no cuttings showing galls may be rooted. Before planting, all cuttings must be dipped in the nicotine wash.
5. No cuttings or stools shall be distributed from the nursery except by permission of an Inspector.

FIG. 2.—Galled Chrysanthemum Leaf.

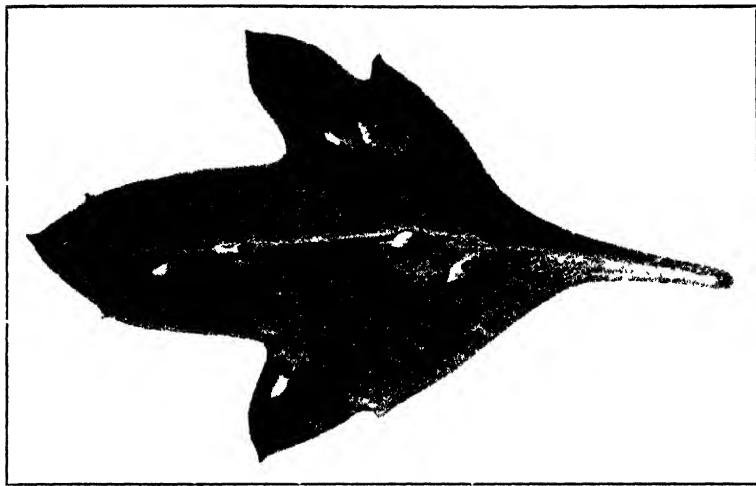
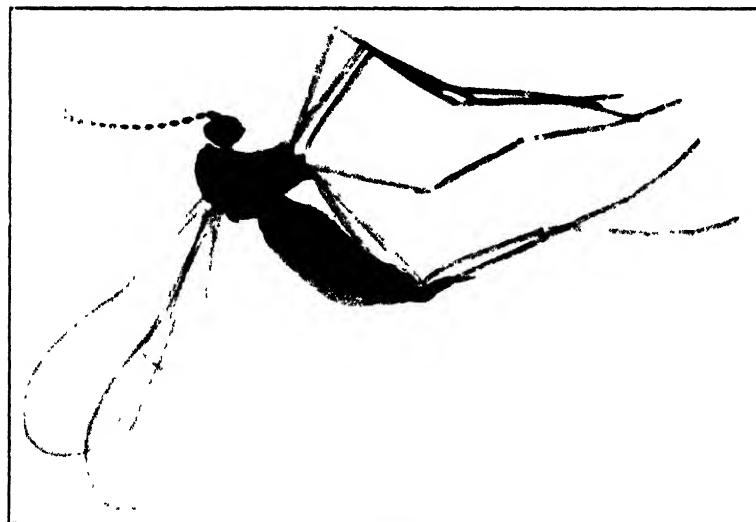


FIG. 1.—Chrysanthemum Midge
(highly magnified)



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FIG. 3.—Distorted Chrysanthemum Stems and Buds.

CHRYSANTHEMUM MIDGE

In conclusion it should be emphasized that the Chrysanthemum Midge is a troublesome pest, which if firmly established could only be controlled at considerable cost to the grower. The longer a colony is allowed to persist the greater the expense and trouble in dealing with it, and, therefore, it is in the interests of all that outbreaks should be speedily discovered and notified to the Ministry.

THE CONTROL OF POTATO BLIGHT IN JERSEY

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FOR several decades the early potato crop has been the mainstay of agriculture in Jersey. About 9,000 acres (nearly one-third of the Island) are planted annually, and the value of the export crop was £979,594 in 1935 and £845,446 in 1936. Planting begins in January and is going forward rapidly in February. The produce is dug and shipped to England between late May to early July, the peak period being during the first or second week in June. Part of the crop is reserved for seed and this is lifted late in June or early in July, after the grower has finished marketing.

The crop suffers from various diseases and pests, but of these Blight, due to *Phytophthora infestans*, is by far the most serious. Only one variety is grown, *International Kidney*,* and this is very susceptible. The disease is also favoured by the mild, humid climate, sea fogs, liberal manuring, close planting and the extensive area planted. Small, isolated outbreaks usually appear in May, but the disease is seldom prevalent until June, and crops harvested towards the end of the season are apt to suffer most. Disastrous epidemics often develop quickly and cause heavy losses; in one experiment 2,665 tubers were dug from a blighted crop and of these 808 were already visibly diseased and a further 1,099 developed disease in storage.

In general, the losses caused by Blight may arise in three ways: (a) decreased yield, (b) disease developing in the tubers subsequent to lifting, and (c) Blight present and obvious in the potatoes at digging time. Decreased yield consequent upon the premature killing of the haulms by disease is not important in Jersey. The chief loss arises from Blight that develops in the produce after lifting. The tubers are apparently sound when dug and packed for export, but they develop disease in transit. As will be shown later, it is not uncommon to lose more than one-half of the produce in this way. The presence of such produce on the markets has far-reaching consequences, since it leads to decreased

* Also known as Boston Early and Jersey Royal.

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demand and lower prices; the loss is not confined to the individual grower, but is sustained by all, including those who are marketing sound produce. The development of disease after lifting occurs also in the seed tubers, and sometimes leads to such an acute shortage of the favourite local variety that other less desirable varieties have to be imported to complete the plantings. The third source of loss is the visibly diseased tubers present at digging time (see Fig. 1). One-third of the crop may be affected, but as these potatoes are discarded in the field they do not influence markets and prices, and the loss is restricted to the particular grower.

The following account of the progress made towards solving the potato Blight problem in Jersey may be of interest to growers of early potatoes elsewhere. It should be remembered, however, that the crop is marketed as soon as it is lifted, and that at harvesting time the haulms are green and the tubers immature. Thus the problem differs from that connected with late crops, where mature tubers are dug after the haulms have died down and where the produce is often stored before it is marketed.

Source of Infection. This was determined by lifting potatoes from crops in various stages of attack. The number of diseased tubers present in the field at digging time was noted, and apparently healthy potatoes were stored and examined later. The results were as follows:—

- (a) *Healthy Crops.* No diseased tubers in the field or subsequently in storage.
- (b) *Recent Attack.* In these instances the haulms were still green, but Blight was prevalent on them and the fungus was sporulating freely. Harvesting at this stage gave little or no loss in the field, but it was quite common for 50 per cent. or more of the tubers to develop Blight in storage as shown in Table I.

TABLE I

Date Dug	Date Examined	No. of Tubers	
		Healthy	Diseased
31.6.32	.. .. 14.7.32	22	108
26.6.33	.. .. 3.7.33	47	147
24.6.32	.. .. 30.6.32	80	114

Nearly the whole of this disease was due to contamination of the potatoes by fungus spores present on the haulms and in the soil at lifting time. This was demonstrated by immersing some of the produce in 1 per cent. formaldehyde solution (1 pint of commercial, 40 per cent., formalin in 99 pints of water) soon after lifting; the treatment kills the spores on the outside of the tubers. Typical results are given in Table II.

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TABLE II

<i>Date Dug</i>	<i>Treatment</i>	<i>Date Examined</i>	<i>No. of Tubers</i>	
			<i>Healthy</i>	<i>Diseased</i>
29.6.36	Undipped	16.7.36	232	404
29.6.36	Dipped	16.7.36	152	13
4.7.36	Undipped	20.7.36	309	264
4.7.36	Dipped	20.7.36	80	3

(c) *Old Attack.* Here the haulms had been completely killed by Blight and were dry and shrivelled. The loss in the field was often serious, amounting in many instances to one-third of the crop. Where the haulms had been dead for two or more weeks the potatoes that were healthy at digging time usually remained sound on storing.

Prevention of Loss in the Field. The results outlined above suggested that this loss could be eliminated by delaying the appearance of Blight on the haulms until nearer digging time. Experiments and practical experience in the field showed that this may be achieved by timely and thorough spraying with the usual Bordeaux or Burgundy mixtures. It is advisable to spray at fortnightly intervals from early in May (when the plants are 8-10 in. high) to late in June; in wet seasons extra applications are necessary. By starting when the plants are small the lower part of the haulm, which is most likely to be attacked first, is protected; subsequent sprayings replace that washed off by rain and cover the new foliage. Probably the commonest mistake made by growers is to omit spraying until Blight appears. At this time the plants are tall and dense and it is impossible to cover the haulm, especially the lower half, satisfactorily.

In some years spraying ensures a sound crop and no further precaution is required. In many seasons, however, it merely postpones the appearance of Blight on the haulms until near digging time, but this delay is sufficient to eliminate loss in the field.

Prevention of Loss Caused by Contamination on Lifting. As already mentioned, this is by far the most serious aspect of the problem. The produce appears to be perfectly sound when dug and packed for export, but Blight develops on it subsequently. The same applies to the seed retained by the grower.

Although spraying delays the onset of disease, it is quite usual for sprayed crops to be attacked late in the season, so that the tubers are contaminated at lifting time. Many growers have experienced such loss, and have, therefore, given up spraying. It is clear that spraying is not always sufficient and that some additional precaution is necessary.

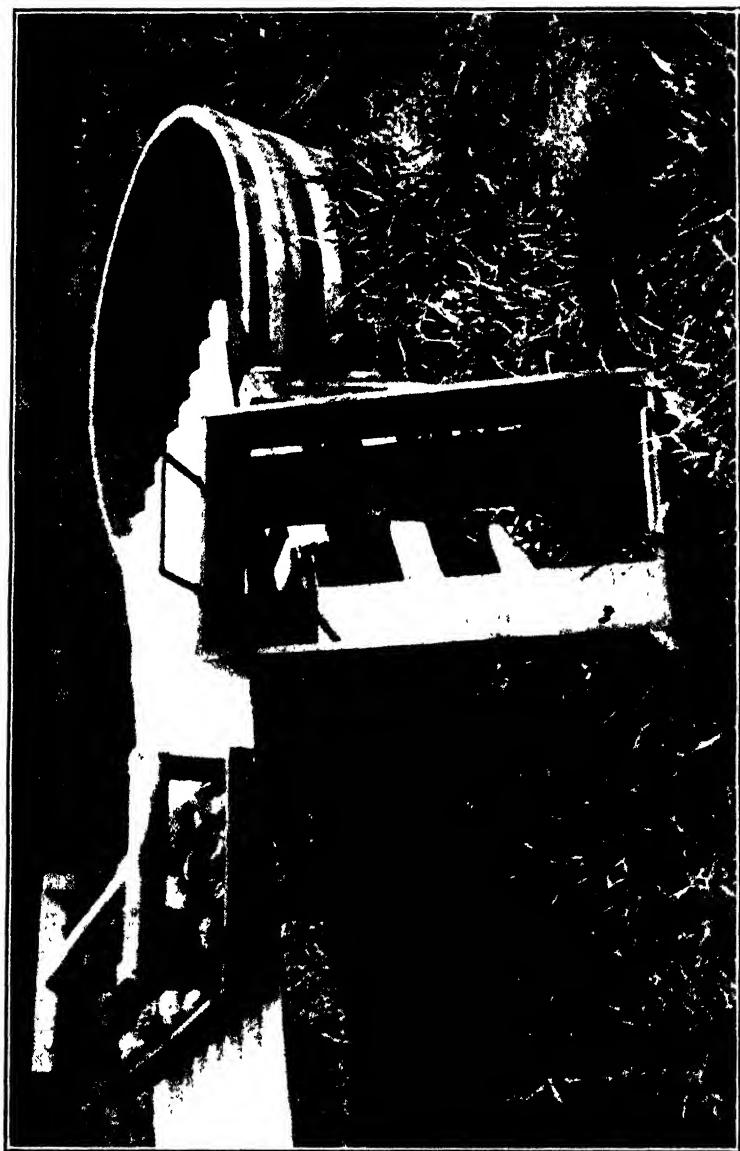
FIG. I.—Loss in the field, showing diseased potatoes left on the field at lifting time.
Photo : Dr. T. Small.



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Photo : Dr. T. Small.

FIG. 2.—Apparatus for dipping seed potatoes.



CONTROL OF POTATO BLIGHT

It may be noted here that the grower cannot always postpone lifting until the disease has killed the haulms; the crop must be harvested so that valuable second crops, such as tomatoes or roots, may be planted.

The fact that spraying postponed the onset of disease, if only for a period of ten to fourteen days, was seen to be of the utmost importance in Jersey because it allowed sufficient time for an excellent crop of tubers to be formed before Blight appeared. Once this stage had been reached the destruction of the haulm whilst healthy, or, at the latest, when disease first appeared, would ensure healthy produce. Two obvious methods of destroying the haulms were tested, (a) scorching, and (b) cutting.

Scorching the Haulms. In earlier experiments a mixture of 12 lb. copper sulphate and $\frac{1}{4}$ lb. caustic soda in 40 gal. of water was used. Good results were obtained in sunny weather, but sometimes two applications, with a three-day interval, were essential. In 1936 dehydrated copper sulphate, in the form of a dry powder, was tried under various conditions, and the resulting scorch was similar to that obtained with the above spray. In the writer's opinion neither this spray nor the dust was as effective as sulphuric acid.

Sulphuric acid (Brown oil of vitriol S.G. 1.70) was tested in 1935. In sunny weather and on crops where the haulms are not tall and dense, 3 gal. of acid in 37 gal. of water applied at the rate of 80 gal. per acre are sufficient to scorch the green haulms in Jersey. In dull weather or where the growth is luxuriant, 5 gal. of acid should be added to 35 gal. of water. The addition of spreaders has so far failed to increase the effectiveness of the spray.

Many acres for market and for seed were treated in 1935 and 1936. No harmful effects have been recorded except that where scorching was carried out two to three weeks before lifting, a few more "greened" tubers were present. Tubers from seed crops treated in 1935 sprouted normally the next season. Some growers are so pleased with the results that they intend to use the acid spray every year, whether Blight is present or not. The crop, which is dug by hand and on a piece-work basis, can be lifted far more quickly after scorching.

Cutting the Haulms. A few growers prefer this older method. The haulms are not removed from the field, but are left on the ground, where they become dried and shrivelled in a few days. The method is practicable in Jersey,

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where the farms are small and where four rows of the closely-planted crop may be cut at one sweep of the scythe. The method is effective provided it is carried out at the proper time.

Summary of Recommendations. In most seasons the loss in the field, as well as that caused by contamination of the tubers on lifting, may be almost entirely eliminated from the early potato crop in Jersey by adopting the following precautions:

1. Spraying thoroughly with the usual Bordeaux or Burgundy mixtures at approximately fortnightly intervals, beginning when the plants are 8-10 in. high. This will delay the appearance of Blight on the haulms until a good yield of tubers has formed.

2. Once this stage has been reached the haulms should be scorched or cut either whilst they are healthy, or, at the latest, as soon as the disease appears. The crop may be dug immediately after the haulms have been destroyed.

Practical Application. The above recommendations have been acted upon by practical growers, and many examples could be quoted to demonstrate how Blight has been reduced to negligible proportions in both export and seed crops. The following results, obtained by a grower who had given up spraying, will serve as an illustration. The case is interesting because it is so typical of what occurs in Jersey if precautions are not taken.

The trial was carried out in a $5\frac{1}{2}$ -acre field, half of which was left unsprayed while the other half was sprayed twice with Bordeaux mixture and dusted once with a dry powder. Before starting to spray, the latter half was cut down by frost, after which a quick and luxuriant growth developed. In spite of this the haulms were kept healthy by spraying until late in June. Spraying delayed the appearance of the disease by about 12 days, and when the writer inspected the field on June 29, Blight was well advanced on the unsprayed crop while very few spots were present on the sprayed plants. On this date the sprayed half, except for a few perches, was scorched with sulphuric acid.

On July 1 lifting began on the unsprayed plot, at which time the haulms were quite dead. At least one-third of the crop was Blighted at digging time and a further substantial loss occurred when the apparently healthy tubers were stored; most of the latter was probably caused by contamination from the soil at lifting time.

CONTROL OF POTATO BLIGHT

The few perches that were sprayed but *not* scorched were also dug on July 1, and by this time the disease had spread and was active on the haulms. No Blighted tubers were found at harvesting time, but more than one-third developed disease on storing in seed boxes. This loss is common in sprayed crops that are attacked by disease near lifting time. If the produce had been exported, the disease would have developed in transit to the markets as previously explained.

The sprayed and scorched crop was lifted on July 7, when a yield of more than 15 tons per acre was obtained. Not a single diseased tuber was present, and the potatoes remained sound in storage. The grower estimates that the spraying resulted in a saving of £100 on this small area.

Treatment of Diseased Crops. When the above precautions have not been taken and Blight has become prevalent, some loss is almost inevitable, but the question arises whether it is possible to reduce this loss. Circumstances may compel the grower to lift the crop, although he knows from experience that, owing to the diseased state of the haulms, much contamination will occur.

Where the attack is prevalent but recent, the development of Blight in the *seed* tubers subsequent to digging may be greatly reduced by immersing them in formaldehyde. The treatment is simple and inexpensive. The apparatus (see Fig. 2) consists of:—

- (1) A low, wide wooden tub containing sufficient fungicide to allow complete immersion of the seed box full of tubers.
- (2) A piece of corrugated iron or other support to form a draining table.
- (3) A wooden container with high sides and two handles, just large enough to hold a seed box. It prevents tubers falling from the seed box during immersion.
- (4) The fungicide recommended is a 1 per cent. solution of formaldehyde (1 pint of commercial, 40 per cent., formalin in 99 pints of water); 15 gal. are sufficient for hundreds of boxes.

The apparently sound seed is placed in the boxes when dug in the field, brought to the farm and treated the same day. As each box is unloaded it is placed in the wooden container, dipped once in the fungicide and transferred to the draining table to allow excess fungicide to run back into the tub. The box is then stacked in the usual way. With four men working (one unloading the boxes, two dipping and one stacking) 360 boxes of seed were treated in 1 hour. The formaldehyde is not injurious; dilutions up to 3 per cent. have been tested and the treated and untreated seed sprouted equally well.

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During the past four years numerous tests have been made under field conditions. Details of two experiments are given in Table II, p. 1164. In 1935 and 1936 fifteen trials were carried out and the combined results were:—

			<i>No. of Tubers</i>	
			<i>Healthy</i>	<i>Diseased</i>
Dipped ..	..	..	1,706	48
Undipped (Controls) ..	..	..	2,512	2,109

Dipping tubers from diseased crops intended for export is impracticable. Such crops should be thoroughly scorched to arrest further development of the attack and, in dry weather, an interval of at least one week should elapse before the tubers are dug, to reduce the risk of contamination from the soil at lifting time. In wet weather a still longer period is necessary. In one experiment foggy periods occurred frequently during the six-day interval between scorching and lifting the crop. The results are given in Table III and show that the tubers, which were apparently healthy when dug, developed much Blight in storage. The potatoes dipped in formaldehyde remained healthy, and this suggests that the undipped potatoes contracted the disease at digging time, and since the haulms were quite dead, the soil was probably the main source of infection.

TABLE III

<i>Treatment</i>			<i>No. of Tubers</i>	
			<i>Healthy</i>	<i>Diseased</i>
Dug 29.6.36 before scorching.	Undipped	..	232	404
.. 4.7.36. Scorched 29.6.36.	"	..	480	130
.. 4.7.36. " 29.6.36. Dipped	"	..	126	1
.. 4.7.36. Not scorched.	Undipped	..	309	264

The cutting of diseased haulms is not recommended, because scorching is preferable and because the fungus remains active on the cut haulms for several days in wet weather.

Where the disease has reached an advanced stage it is doubtful if much can be done to reduce the loss. Probably the best plan is to allow the disease to run its course and kill the haulms and to delay digging as long as possible.

In conclusion, the serious losses caused by Blight on the early potato crop in Jersey may be almost entirely eliminated by adopting the recommendations already outlined. In view of the high value of the sound crop, the expense entailed in carrying out the precautions is very small indeed. The treatment of diseased crops gives less satisfactory results; some loss is inevitable, but this can be reduced by the methods suggested in the second part of this article.

MARKETING NOTES

Milk Marketing Scheme. Pool prices and rates of producer-retailers' contributions for January, 1937, are given below, with comparative figures for December and January, 1936. The wholesale liquid milk price was 1s. 5d. per gal. in each month.

Region	Pool Prices			Producer-Retailers' Contribution		
	Jan.	Dec.	Jan.	Jan.	Dec.	Jan.
	1937	1936	1936	1937	1936	1936
		d.	d.	d.	d.	d.
Northern ..	14	14	13½	2½	2½	3½
North-Western ..	14	14	13½	2½	2½	3½
Eastern ..	14½	14½	13½	2½	2½	2½
East Midland ..	14½	14½	13½	2½	2½	3½
West Midland ..	13½	14	13½	2½	2½	3½
North Wales ..	13½	14	13½	2½	2½	3½
South Wales ..	14	14	13½	2½	2½	3½
Southern ..	14½	14½	13½	2½	2½	2½
Mid-Western ..	14	14	13½	2½	2½	3½
Far-Western ..	13½	13½	13	2½	2½	3½
South-Eastern ..	14½	14½	14	2½	2½	2½
Unweighted Average ..	14·05	14·14	13·43	2·59	2·52	3·18

These prices are exclusive of any premiums for special services and level deliveries, and also of the Accredited producers' premium of 1d. per gal.

The sum required for the payment of the accredited premium was equivalent to a levy of 350d. per gal. on pool sales.

The inter-regional compensation levy was fixed at 1½d. per gal., compared with 2d. per gal. in January, 1936. A levy of ½d. per gal. was made for general expenses.

Sales on wholesale contracts were as follows:—

	Jan., 1937 (estimated)			Jan., 1936	
	Gal.	Gal.	Gal.	Gal.	Gal.
Liquid	48,145,121	46,400,975
Manufacturing	16,006,196	21,106,120
				<hr/>	<hr/>
				64,151,317	67,507,095

Percentage liquid sales ..	..	75·05	68·73
Percentage manufacturing sales ..	..	24·95	31·27

The average realization price of manufacturing milk during January was 6·25d. per gal., compared with 6·02d. per gal. for January, 1936. The quantity of milk manufactured into cheese on farms was 351,617 gal., compared with 428,146 gal. in the previous month and 355,384 gal. in January, 1936.

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Milk Products Marketing Scheme. The public inquiry into objections to this scheme ended on January 29 after a hearing lasting 16 days in all, 14 in London and 2 in Edinburgh.

Pigs and Bacon Marketing Schemes : Conditions of Sale of Pigs to Curers. The Pigs Marketing Board have made a determination relating to the sale of pigs by registered producers to registered bacon curers, to operate from February 15 until further notice. The determination applies to every agreement made by a registered producer with a registered curer for the sale of pigs having a dead-weight of from 7 score to 10 score 10 lb. and intended to be used for the production of bacon. The price to be paid is left to be agreed between producer and curer, but every agreement must fix the price per score dead-weight according to the class of the pig, and must also provide that every pig sold under it shall be classed according to dead-weight and graded after slaughter according to measurements and conditions similar to those provided for under the 1937 contract which was declared void. The agreed price is to be subject to an addition or deduction for a pig other than a Grade B pig on the same scale as was prescribed by the Board for the 1937 contract.

Provision must be made in every agreement for sale for the deduction and retention by the curer of 6d. per pig from the agreed price towards his expenses in insuring against or covering any loss through damage to pigs during transit or by disease. A further deduction of 6d. per pig is to be remitted to the Pigs Marketing Board by or on behalf of the producer in respect of services rendered to the producer by the Board. The curer must also agree to supply the producer and the Pigs Marketing Board with a grading ticket showing the class, weight, grade, and price of each pig, and to permit any person appointed by the Board to have access to his premises for the purpose of noting and checking the weighing, classification, and grading of the pigs.

Potato Marketing Scheme : Census of Potato Stocks. All registered producers and authorized merchants have been requested to furnish returns to the Potato Marketing Board showing the stocks of potatoes on hand on the night of February 13.

List of Authorized Merchants. The revised list for 1937 has been issued to all registered producers.

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Hops Marketing Scheme. Final figures relating to the 1935 hop crop show that total sales by the Hops Marketing Board amounted to 224,026 cwt. and receipts to £2,025,000, including a payment from the Levy Fund to make up the agreed average price of £9 per cwt. on the estimated demand of 225,000 cwt. Hops of the 1935 crop remaining on hand are to be disposed of for uses other than brewing.

Milk Acts, 1934 and 1936 : Manufacturing Milk. Advances made by the Ministry up to February 15, 1937, in respect of manufacturing milk were as follows:—

Section of Act		Period of Manufacture	Quantity	Advances
<i>(a) Milk Marketing Board for England and Wales.</i>				
1	In respect of milk : Manufactured at factories other than the Board's	April, 1934, to November, 1936	Gallons 488,540,963	£ 2,142,473
2	Manufactured by the Board ..	April, 1934, to Sept., 1935	2,573,662	12,850
3	Made into cheese on farms ..	April, 1934, to June, 1936	36,055,516	187,463
* Total for England and Wales ..			527,170,141	2,342,786
<i>(b) Government of Northern Ireland.</i>				
6	In respect of milk : Manufactured into cream and butter at registered creameries ..	April, 1934, to Sept., 1936	Gallons 60,168,430	£ 359,021
TOTAL ..			587,338,571	2,701,807

* Owing to the Cheese-Milk Prices for August and September, 1936, being in excess of the Standard Price, no subsidy is payable in respect of milk produced and manufactured in these months.

Cheese-Milk Price. For the purpose of payments under the Milk Acts, 1934 and 1936 (whether by the Exchequer to Milk Marketing Boards or by Boards to the Exchequer) in respect of milk used for manufacture, the cheese-milk price has been certified by the Minister and the Secretary of State for Scotland to be 5·01 pence per lb. for the month of February, 1937.

Wheat Act, 1932 : Sales of Home-grown Wheat, Cereal Year, 1936-37. Certificates lodged with the Wheat Com-

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mission by registered growers during the period August 1, 1936, to February 5, 1937, cover sales of 13,710,534 cwt. of millable wheat as compared with 21,532,591 cwt. in the corresponding period (to February 7) in the last cereal year.

Anticipated Supply of Millable Wheat. The Minister, on the recommendation of the Wheat Commission, has made, under Section 2 of the Wheat Act, the Wheat (Anticipated Supply) No. 1 Order, 1937. This Order varies the Wheat (Anticipated Supply) No. 2 Order, 1936, by substituting 25,750,000 cwt. for 26,000,000 cwt. as the quantity of home-grown millable wheat of their own growing that it is anticipated will be sold by registered growers during the cereal year 1936-37.

New Quota Payments Order. The Minister, in pursuance of the powers conferred upon him by the Wheat Act, 1932, and on the recommendation of the Wheat Commission, has made the Wheat (Quota Payments) No. 1 Order, 1937, prescribing that the amount of the quota payment, which every miller and every importer of flour shall be liable to make to the Wheat Commission in respect of deliveries of flour during the period commencing January 27, 1937, shall be 2·4 pence per cwt. (equivalent to 6d. per sack of 280 lb.). This Order supersedes the Wheat (Quota Payments) No. 3 Order, 1936, under which the quota payment has been 4·8 pence per cwt. (1s. per sack of 280 lb.) since November 1, 1936. The new rate is again the lowest since the Wheat Act came into force.

Sugar Industry (Reorganization) Act, 1936: *Production of Home-Grown Beet Sugar during the 1936-37 Campaign.* According to information furnished to the Ministry by the British Sugar Corporation, Ltd., the total quantities of beet sugar manufactured in Great Britain during January, 1937, and the corresponding month in 1936, were:—

	<i>White</i>	<i>Raw</i>	<i>Total</i>
	cwt.	cwt.	cwt.
1937	672,406	806,843	1,479,249
1936	351,980	516,140	868,120

The total quantities of sugar produced to the end of January in each of the two manufacturing campaigns were:—

	<i>White</i>	<i>Raw</i>	<i>Total</i>
	cwt.	cwt.	cwt.
Campaign 1936-37	5,319,609	5,365,716	10,685,325
" 1935-36	4,339,975	5,405,962	9,745,937

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1936-37 Campaign. Provisional results of the present campaign are now available and are shown below in comparison with the final figures for the 1935-36 campaign:—

		1936-37 (Provisional)	1935-36
Acreage		354,909	374,147
Beet tonnage		3,448,000	3,403,989
Yield per acre (tons)		9.7	9.1
Sugar content (%)		17.3	16.4
Sugar production (tons)		537,000	487,325

Live Stock Industry Bill. The debate on the Second Reading of the Bill in the House of Commons took place on January 21 and 22. The Bill was read a second time, and proceedings in Standing Committee commenced on February 2. The Financial Resolution was agreed to on January 25.

Cattle Fund. The following table gives particulars of payments made under the Cattle Industry (Emergency Provisions) Acts, 1934 to 1936, and shows the numbers of animals marked on importation into Great Britain:—

	April 1, 1936, to Jan. 31, 1937	April 1, 1935, to Jan. 31, 1936	*Sept. 1, 1934, to Jan. 31, 1937
Payments	£3,298,590	£3,161,338	£9,195,947
Animals in respect of which payments were made	1,405,268	1,334,159	3,882,316
Average payment per animal	£2 6 11	£2 7 5	£2 7 4 1
Imported animals marked at Ports (Great Britain only)	482,401 (up to Jan. 30)	381,333 (up to Jan. 30)	1,234,815† (up to Jan. 30)

* Commencement of subsidy payments.

† As from August 6, 1934.

The International Beef Conference and Empire Beef Council. In the course of the statement he made in the House of Commons on July 6, 1936, outlining the Government's long-term policy for the live stock industry, Mr. Elliot said:—

"It is the Government's desire that, at the earliest possible date, the responsibility for securing stable market conditions should be assumed by producers in the various countries concerned and exercised in the light of joint discussion of the problems involved."

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"This discussion would be secured by the institution of an Empire Meat Council, representative of the United Kingdom and other Empire countries concerned, and an International Meat Conference, representative of the United Kingdom, other Empire countries and the foreign countries supplying substantial quantities of meat to this market."

The International Conference and the Empire Council will be concerned, in the first instance at any rate, only with imports of beef to the United Kingdom. Discussions concerning the constitution and functions of the International Beef Conference and the Empire Beef Council have now reached an advanced stage, and informal meetings of both bodies have already been held.

Producers in the United Kingdom, acting through the National Farmers' Unions for England and Wales, Scotland and Northern Ireland, have nominated Lord Bingley as their representative, and, on January 29, the Minister of Agriculture and Fisheries announced in the House of Commons that Lord Bingley had consented to his nomination. Lord Bingley was Chairman of the Reorganization Commissions for Pigs and Pig Products and for Fat Stock.

Bacon Supplies in 1936. The following table shows the supplies of bacon (including salted pork and tinned hams) that were available from all sources for consumption in the United Kingdom in each month of 1936:—

Month 1936	Great Britain Output			Northern Ireland Output	Net Imports†	Total supply of bacon to U.K. Market
	From home pigs	From im- ported pigs and carcasses*	Total			
Jan. ..	cwt. 184,100	cwt. 27,100	cwt. 211,200	cwt. 57,500	cwt. 565,600	cwt. 834,300
Feb. ..	169,400	34,700	204,100	50,000	548,200	802,300
Mar. ..	184,600	43,400	228,000	54,300	606,100	888,400
April ..	201,400	39,900	241,400	56,900	588,700	887,000
May ..	195,000	43,500	238,500	56,300	592,600	887,400
June ..	173,000	43,500	216,500	59,400	614,300	890,200
July ..	188,500	44,100	232,600	57,800	651,800	942,200
Aug. ..	198,800	44,000	242,800	52,300	647,000	942,100
Sept. ..	223,700	29,900	253,500	66,900	538,400	858,800
Oct. ..	236,100	29,600	265,600	77,400	562,800	905,800
Nov. ..	200,700	22,500	223,300	72,600	602,800	898,700
Dec. ..	162,000	25,100	187,100	63,800	643,100	894,000
TOTAL	1,231,300	427,300	2,744,600	725,200	7,161,400	10,631,200

* Including Northern Ireland pigs shipped to Great Britain.

† Imports minus re-exports.

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Total supplies (exclusive of the output of the small unregistered curers) amounted to 10,631,200 cwt., compared with 10,548,400 cwt. in 1935.

Bacon Import Arrangements for 1937. In the January, 1937, issue of this JOURNAL (p. 950) it was stated that the foreign quota for the first 6 weeks of 1937 had been fixed at a rate approximately 10 per cent. higher than that for the first 4 months of 1936. It has been decided to continue the foreign quota at this rate to the end of March, 1937. The allocations to the individual foreign exporting countries for the period February 12 to March 31, are as follows:—

Country							Allocations Cwt. (a)
Denmark ..	..	..	..	..	..	..	447,442
Netherlands ..	..	..	..	..	..	..	66,940
Poland ..	..	..	..	..	..	..	56,018
Sweden ..	..	..	..	..	..	..	33,118
Lithuania ..	..	..	..	..	..	..	20,787
Estonia ..	..	..	..	..	..	..	5,285
Finland ..	..	..	..	..	..	..	2,819
Latvia ..	..	..	..	..	..	..	4,932
U.S.S.R. ..	..	..	..	..	..	..	5,932
Argentina ..	..	..	..	..	..	..	4,932
U.S.A. ..	..	..	..	..	..	..	56,370
Allowance for imports from foreign countries not scheduled to the Bacon (Import Regula- tion) Order ..							<u>17,049</u>
TOTAL							721,681

(a) Subject to amendment, as regards certain individual countries, in respect of overshipments or undershipments in previous periods.

After March 31, 1937, imports of bacon and hams from foreign sources will be regulated from time to time in the light of recommendations made by the Market Supply Committee, who will be assisted by a Bacon Supplies Consultative Committee representative of all the interests concerned.

Regulation of Imports of Processed Milks. Imports of processed milks during the year 1936, together with the allocations made to foreign exporting countries and the Irish Free State, and imports from other Empire countries in the two previous years, are shown in the table on page 1176.

Imports from the main foreign sources of supply to the end of July, 1937, are governed by an arrangement that

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Source	Condensed Skimmed Milk	Condensed Whole Milk	Milk Powder	Cream
	Cwt.	Cwt.	Cwt.	Cwt.
Foreign Countries—				
Allocations	1,217,400	253,200	77,500	34,100
Imports	1,281,300	205,500	68,000	34,600
Irish Free State—				
Allocations	84,000	21,600	220	37,000
Imports	82,000	18,400	270	41,800
Other Empire Countries—				
Imports, 1934	—	119,900	172,700	—
Imports, 1935	—	128,800	172,200	—
Imports, 1936	—	97,600	173,300	200

provides for the following percentage reductions calculated on the quantities imported in the corresponding period of the twelve months, June, 1932, to May, 1933: For condensed whole milk and milk powder, 50 per cent.; for condensed skimmed milk, 45 per cent., rising to 60 per cent. from the beginning of April, 1937.

These quantitative arrangements are supplemented by agreements between the various manufacturing interests concerning minimum selling prices in the United Kingdom market. In addition, the Netherlands authorities have taken steps to overhaul the machinery for marketing Dutch condensed skimmed milk in this country.

National Mark Scheme for Derby Cheese. The Ministry's proposed scheme for applying the National Mark to Derby Cheese was adopted at a meeting of Derby Cheesemakers, arranged by the Derby Cheesemakers' Association on January 20 this year. The meeting also elected the National Mark Derby Cheese Grading Committee to appoint a grader for the purposes of the scheme, and to supervise the grading arrangements subject to the overriding supervision of the Ministry.

One standard grade only has been set up in connexion with the scheme. The definitions of quality of this grade, which is designated "Selected" Derby Cheese, are laid down in the Agricultural Produce (Grading and Marking) (Derby Cheese) Regulations, 1937.* The regulations came into force on

* S.R. and O., 1937, No. 122 (Obtainable from His Majesty's Stationery Office, Adastral House, Kingsway, London W.C.2. Price 1d., post free 1½d.)

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February 8, 1937. Copies of Marketing Leaflet No. 88, explaining the scheme, may be obtained free of charge on application to the Ministry.

National Mark Eggs in 1936. The National Mark scheme for eggs, now entering upon its ninth year of operation, still maintains its position as one of the most important of the National Mark schemes. The total output of authorized packing stations for 1936 was 516 million eggs, of which 81 per cent. were packed under National Mark labels. The number of packing stations operating under the scheme in 1936 was 195—an increase of 3 during the year.

The following table shows the classification of authorized packing stations in relation to their total output during the last 3 years:—

Output	No. of Stations		
	1934	1935	1936
Over 10 million eggs	5	5	3
Over 5 and up to 10 million eggs ..	23	27	22
Over 2 and up to 5 million eggs ..	51	56	64
Up to 2 million eggs	106	104	106

National Mark Scheme for Cabbage Greens and Cabbages. The Minister has given notice of his intention to make amending regulations under the Agricultural Produce (Grading and Marking) Acts, 1928 and 1931, which will have the effect of varying, during the months of March and April in each year, the minimum weight prescribed in the case of the grade designation " Selected Hearted " in Schedule I of the principal regulations (S.R. & O. 1934, No. 204).

Copies of the draft regulations may be obtained from His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C.2, or through any bookseller, price 1*d.* each, post free 1*½d.*

National Mark Publicity. National Mark " Weeks " will be held in Ipswich (March 10-20) and in Lincoln (April 7-17), 1937.

The principal features of these " campaigns " will be National Mark exhibitions staged by the Ministry; shop-window display and poster ballot competitions; cinema lectures for housewives and school children; and special cooking demonstrations and competitions for residents of these towns and the surrounding districts.

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Cultivations. Up to the time of writing, the weather during the past winter has been unfavourable for getting the soil into good condition for the March seed beds, there having been much rain, but little or no frost. The kind of tilth produced by spring cultivations is controlled much more by the weather in the preceding months than by the intensity of treatment at this time of the year. One of the characteristic effects of a tilth produced after a spell of frost is the quick get-away that it enables the crop to make. A good, quick start makes itself felt throughout the life of a crop; the experiences of growers, and the observations of the scientist when correlating the state of a crop at various stages of growth with the yield, show the importance of this. Illustrations of this can be readily recalled; a difference of a few hours in the times of sowing swedes, or an accidental difference in the depth of sowing from a drill coulter often causes a portion of the crop to establish a lead in the first month, and this superiority is maintained until the crop is mature. One of the interesting conclusions reached, as a result of the recent experiments on cultivations at Rothamsted and Cambridge, is that many of the ordinary cultivations are of no value. Work on soil moisture at Rothamsted has convinced the experimenters that water does not move to any important extent in the soil by capillarity, and that it is consequently useless to attempt to control the movement of moisture in the soil by harrowing and rolling; once the soil has been got into the crumb-structure state, further operations are considered to have no value, except to pack the soil closer to the seed, or to destroy weeds.

As regards the autumn-sown crops, beans are, if possible, hoed this month, and wheat may be harrowed, rolled and top dressed; after such an open late autumn and wet, early winter, an early application of nitrogen is recommended. The rolling is particularly useful on the lighter soils; the benefits of sheeping wheat may arise, on the lighter soils, as much from the consolidation as from eating off the crop. A discussion arose two years ago over sheeping a 100-acre field

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of wheat on a mechanized farm near Oxford. There was, owing to the large size of the field, an interval of more than a fortnight between the time the folding was commenced and finished. It was argued that the crop would ripen earlier where it was first folded, and that this would cause inconvenience when " combining "; a letter was written to the grower at harvest time, asking if there was much difference in the ripening of the wheat. In reply, it was stated that practically no difference could be detected.

Grass and Clover Seeds. The seeds mixture allows great scope for custom and opinion regarding both the total quantity to be sown and the constituents. It may surprise some to know that, on extensive areas of non-agricultural land, 100 lb., and even 200 lb., of seeds are sown to the acre; in Kent, the county authorities use the latter amount when seeding sports grounds, having been convinced by experience that it is essential in order to establish rapidly a good turf. Farmers in the Romney Marsh use 70-100 lb. of seed to the acre, which is twice the usual rate.

Proper consolidation of the soil is very important in securing a good " take " of grass and clover seeds, and the effect is particularly marked in regard to red clover. At the Bangor College Farm, it has repeatedly been noticed that red clover, completely fails to establish itself on a turf ploughed up and resown with either rape or oats the same year. At first, this was attributed to possible sourness or lack of some manurial ingredient in the freshly-ploughed turfy soil, but in a trial last year, no improvement was effected by applications of lime, slag and kainit, whether alone or in different combinations. Hardly a plant of red clover can be found in ten acres, although grasses and wild white clover have established themselves well. A colleague observes that this need of red clover for a well-consolidated seed bed can be noticed in any field of maiden seeds if moles are present. No healthy plants of red clover will be found over or near a mole run.

The constituents of the mixture vary with the length of the ley, soil, etc.; the more permanent species figure largely in the longer leys. Again, in long leys, the proportion of indigenous grasses should be increased, though these should not eliminate the commercial strains that have the advantage of starting growth very early in spring; an extended pasture period may be obtained by including indigenous strains to the extent of about one-third of the mixture. With regard

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to soils, clover does not thrive in the absence of lime; this explains why it often fails on light soils. Acid soils are not favourable to perennial ryegrass, the plants tending to be small, with little reserve strength to meet adverse conditions, such as frost or drought. Pests such as clover sickness and frit-fly may influence the choice of constituents; ryegrass encourages frit-fly in wheat when the ley is ploughed, and its amount should be reduced for short leys if loss from this source is feared.

Early Bite and Catch Crops. The possibility of providing an early bite by applying nitrogenous manures to grass land in February or early March was much discussed a few years ago, and raised false hopes for many farmers. In some years, the method proved successful, but, most frequently, the application did no more than improve the colour of the grass. The explanation of the variable results is provided by research at Jealott's Hill (Page, 3rd Internat. Grass Land Conference, 1934). When the temperature at a depth of 4 in. is 42° F. or below, there is very little growth, nitrogen or no nitrogen. When the temperature rises above 42° F. growth commences, but until 48° F. is reached it is at a low rate owing to the slowness of those soil biological processes that liberate nitrogen. If, however, the soil is rich, or nitrogenous manures have been applied, these biological processes are accelerated, and more growth takes place in the interval between 42° and 48° F. The greatest effect from applying nitrogenous manures for an early bite is thus in those years when the soil remains for a long time in the critical zone, between 42° and 48° F., as in 1930. In 1934, for instance, it took only three days at Jealott's Hill to pass the critical zone, and the unmanured plots reached production only 2 or 3 days later than those that had received nitrogenous manuring, as against 12 days in 1930.

Other important factors in the provision of an early bite are the intensity of grazing in the previous autumn and winter, and the proportion of early species, such as perennial ryegrass, tall fescue and meadow foxtail. In temporary leys, Italian ryegrass is the most important constituent if extreme earliness is required. Very early bites are not always welcome. On mountains, these tempt sheep to dangerous positions on rocks, and up to a generation ago it was quite a common practice on many Welsh hills to keep goats, so that

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they would get these early bites before the sheep; the goats were done away with for several reasons, such as their habit of eating off the bark of trees.

The provision of catch crops may often be more certain than an early bite of grass. Thus, rye, sown in August or September, following a silage crop, or second early potatoes, will provide for late March or early April; 1½ cwt. nitrochalk to the acre, applied in February, will increase the crop. In the earlier parts, as in the south, crimson clover, sown immediately after harvest, will provide food in March. This year, additional green food of this kind will be doubly welcome. The best hay is usually reserved for this time of the year, but, this season, there has been little or no "best" hay.

Keep on Mountain Land. The lower mountain slopes are usually stocked with sheep throughout the winter, the ewes remaining there until they may be brought down for lambing in April. To ensure sufficient keep over winter, these enclosed portions of mountain or moorland are not grazed during the summer. *Nardus*, *Molinia*, sheep's fescue, bracken and *Calluna* are the predominant species on such land; there is a lack of legumes in such grazings. The inferior *molinia* type of pasture can be converted to the *Agrostis*-fescue type by increasing the fertility, when superior winter grazing is thus provided. Some moorland plants and herbs play an important rôle at this time of the year. Fagan and Watkins (*Welsh Jour. of Agric.*, VIII, 1932) and Brynmor Thomas (*Agric. Progress*, XII, 1935) have interesting observations on the value of such plants in mountain grazings. Ling and bilberry are amongst the most common herbs eaten by stock in such pastures, the topmost shoots being eaten. In many places, ling is the mainstay of the Blackface. It is evergreen and easily reached in snow; Thomas states that it is only after an exceptionally hard winter that it is of little feeding value at this time of the year.

There is a certain amount of apparent conflict of interest between the agriculturist and the sportsman with regard to heather. Heather is improved by burning, which induces young, tender shoots, instead of the old woody stems; further, old heather is difficult for sheep to travel across. If, however, too much heather is burnt at once, the grouse may leave the moor—according to some, this plant forms 50 per

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cent. of the diet of the grouse. Men of experience consider that the interests of the flockmaster and of the sportsman in regard to ling are by no means incompatible, well regulated burning being best for both. Many farm leases contain provisions to control the burning of heather, ten- or even twenty-year burning rotations being stipulated. It will be recalled that the Agricultural Holdings Act, 1923, does not exempt from fines or penal rents infringements of regulations for the burning of heather. Cottongrass, or drawmoss, a sedge, flourishes only on the wetter type of moor, and provides keep in February and March, when the heather may be poor. It is prized by shepherds, who regard as valuable occasional patches of wet peat capable of carrying drawmoss; Thomas remarks that great care is taken to avoid overdraining such patches.

Lambs. Judging by two sets of statistics issued recently, the prospects for the fat lamb trade do not appear very bright if we look beyond the coming season. In the December live stock census for England and Wales, a slight increase is recorded in the number of ewes kept for breeding, and nearly a 50 per cent. increase in the number of ewe lambs intended for breeding, these rising from just under a million to nearly 1,400,000; most of the latter will not produce fat lambs until next year. Again, in the *New Zealand Journal of Agriculture* for December, 1936, the estimate of the current season's lambing in that country is put at 16,862,000, an increase of nearly 10 per cent. over last year's figure.

Easter lambs are well on, and will soon be marketed. The first consignments of Irish milk-fed lambs arrived well in time for Easter last year, being landed in Holyhead before the middle of March. The balance of limited supply and demand for lambs at this time may easily be upset if these importations are increased. To attain weights of 70-80 lb., the lambs should be dropped in December or January, and they as well as their mothers should be well fed. A large proportion of the lambs do not reach this weight, but the high prices make it profitable to sell them at this stage.

The majority of grass flocks lamb in March, and it is an important month on farms where such flocks provide, with the cattle, the bulk of the revenue. A few extra lambs saved will soon repay extra labour, or extra shelter. On farms where little or no feeding is provided, additional to the grass,

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the flockmaster should consider seriously the merits of using the plough to provide kale or mangolds for the flock in March and April. If the ewes were encouraged to milk better, the lambs could be sold earlier, and the grass land would have a better chance of recovery from sheep staining and parasites before the next season.

March provides a good opportunity for selling off fat rams; if old sheep are saleable at any time, they are saleable in March and the first half of April. Ewes that have lost their lambs early, and that are not to be retained for breeding should, if possible, also be prepared for sale at this season.

Shearing sheep in March is not often heard of, except perhaps in connexion with the much repeated story of the stockbroker who, on a rising wool market, wired his farm bailiff to shear. Shearing at this time of year is, however, practised with sheep that are to be exhibited at shows during the summer, early shearing being particularly essential in those breeds having wool that ripens late. When sheep are shorn now, the fleece has time to develop in time for the show season. Some sheep societies fix a date before which the exhibits must not be shorn.

Store Cattle. The price of store cattle, which are bought in large numbers from now until the end of April, depends on the prospects for grass, as well as on fat cattle prices. It is hoped that, in the general interests of British agriculture, the position of the rearer of store cattle will improve, though it hardly seems possible. The position in cattle-rearing areas like Wales, and the poorer districts of the west of England and Scotland, is reflected, not only in the reduced receipts from store cattle, but also in the general level of farming. In such areas there is much marginal land, which quickly becomes rough grazing if neglected. On many farms in those areas, selling milk, instead of making butter and rearing calves, results in a proportion of the grass land being left for sheep, and not kept in cultivation.

Seed Treatment. Good cultivation and manuring may give disappointing results if precautions are not taken against seed-borne diseases. The pickling of seed corn has been simplified by the use of certain chemicals in powder form; solutions of copper-sulphate or of formalin, have the disadvantage that the grain requires drying before it is sown.

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The latter also has the disadvantage that it looks harmless, and, if one cannot resist the temptation to add a little extra "for luck," germination suffers. Half a pound sulphate of copper in enough water to moisten 4 bus. of grain, or one fluid oz. of commercial formalin to 2 gal. water, will give very efficient treatment.

Dry copper carbonate, mixed with grain at the rate of $\frac{1}{2}$ lb. per $2\frac{1}{2}$ cwt. of grain, has also been much used in recent years for disinfecting seed. Recently, however, organic mercurial compounds have come into general practice, and they are more potent than copper. These compounds, costing only about 1s. per acre, give almost complete control of certain seed-borne diseases, like Bunt in wheat, Leaf Stripe and Covered Smut of oats and barley, Loose Smut of oats, and Net Blotch of barley. If the fungus is within the grain, as in Loose Smuts of barley and wheat, pickling cannot give control, and one should not blame the material if such a disease appears. These seed disinfectants may be mixed with the grain on the barn floor, or in a special mixer; there are inexpensive models that give continuous operation, the seed and powder being let in at one end, and emerging well mixed at the opposite end. These mercury compounds are used as a matter of routine by many progressive farmers and seeds-men. The treatment is a cheap form of insurance against the diseases mentioned. It may be said, in addition, that there is distinct evidence that these compounds stimulate the seed, helping it to get a good start, the importance of which has been stressed in the opening paragraph of these notes.

[*Note. The Ministry desires to express its cordial appreciation of the valued services of Mr. E. J. Roberts as the writer of these monthly notes "on the Farm" since April, 1935. With the present issue, Mr. Roberts relinquishes, at his own desire, the preparation of these articles, which, from the next (April) issue onwards, will be contributed by Dr. Robert W. Wheldon, Department of Agriculture, Armstrong College, Newcastle-upon-Tyne (University of Durham).]*]

NOTES ON MANURING

F. HANLEY, M.A.,
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Size of Potato Tubers. Experiments have shown that size of seed and distance between sets may affect both the total yield and the size of the tubers produced. In general, the proportion of tubers below ware size increases as the size of the seed planted is increased, whereas, beyond certain limits that vary with the size of seed, wider spacing leads to a decrease in total yield, but increases the percentage of ware in the crop.

It is frequently assumed that nitrogenous manures exert a considerable influence upon size of produce—more so than other types of fertilizer. Such an effect has been noted on several occasions, but is by no means universal. In some experiments potash has proved more effective than nitrogen in increasing the percentage of ware, whilst in others fertilizers have had little or no influence on tuber size.

In Vol. XXXV, No. 1, April, 1928, p. 36, of this JOURNAL, T. J. Shaw described experiments on potatoes in Devonshire in which striking responses to fertilizers were obtained, both as regards total yield of tubers and also percentage of ware. The effects of the heaviest dressings of nitrogen, potash and dung used in those experiments were as follows:—

Sulphate of Potash	Percentage of Ware.			
	With Dung		Without Dung	
	S/Ammonia	S/Ammonia	S/Ammonia	S/Ammonia
0 cwt. 	0 cwt.	3 cwt.	0 cwt.	3 cwt.
3 cwt. 	38·6	47·9	28·0	34·9
	47·6	60·2	37·3	50·0

It will be seen that, not only were potash and nitrogen effective in raising the percentage of ware, both in the presence and absence of dung, but that dung itself gave a substantial increase in the proportion of ware. It should be noted, however, that the percentage of ware was extremely

NOTES ON MANURING

low at this centre and hence there was considerable scope for improvement. Comparing plots receiving sulphate of ammonia, potash gave a larger increase in the absence of dung than in its presence, whilst sulphate of ammonia was more effective in the presence of potash than in its absence.

In a report of a further series of trials in the Norfolk Marshlands in the seasons 1931-33, G. H. Bates gave yield data for seven fertilizer experiments, including applications up to 16 cwt. of fertilizer mixture per acre, in which the proportion of ware to total produce varied from as low as 65 per cent. to as high as 95 per cent. The general effect of fertilizer on percentage ware, however, seems to have been relatively small, and even the heavy applications, which included 4 cwt. per acre of sulphate of ammonia, failed to produce any very striking results. The mean increase or decrease in percentage ware given by each of the fertilizers, over plots not receiving that fertilizer, was as follows:—

*Superphosphate (35 per cent.)	4 cwt. per acre	..	+ 0·75 per cent.
" (35 "	6 "	..	+ 0·57 ..
" (35 "	8 "	..	- 0·17 ..
*Muriate of Potash	2 "	..	+ 1·25 ..
" "	4 "	..	+ 2·2 ..
*Sulphate of Ammonia	2 "	..	+ 2·67 ..
" "	4 "	..	+ 3·82 ..

†Artificials scuffed into bottom of ridge as compared with artificials broadcast

.. + 1·43 ..

* Average of 4 experiments. † Average of 3 experiments.

Though increases up to 6 per cent. were obtained in one or two experiments, none of the fertilizers produced a very striking effect on the percentage of ware, despite the fact that nitrogen and phosphate gave significant increases in yield at all four centres, and potash at two centres. Neither did the position of the fertilizer in the soil exert any considerable effect on this proportion, in the three experiments where this point was tested. The effect of superphosphate is particularly small in view of the fact that the yield of the crop was substantially increased by this fertilizer.

Further information as to the influence of manurial treatment on proportion of ware is given in the Rothamsted Report for 1935, from which the following data have been abstracted. The riddle size used in the separation of ware tubers from the seed and chats in these experiments was generally 1½ to 1¾ inches.

NOTES ON MANURING

MEAN INCREASE OR DECREASE IN PERCENTAGE OF WARE

<i>Manurial Treatment</i>	<i>Centres where significant effect on yield was obtained</i>	<i>Other Centres</i>
Superphosphate 3½ cwt. per acre ..	+ 0·81 (7)	- 1·16 (12)
Sulphate or muriate of potash 2 cwt. per acre	+ 10·46 (7) + 1·65 (20)	+ 0·82 (8) - 0·36 (10)
Sulphate of ammonia 3 cwt. per acre ..	+ 0·85 (2)	—
Dung (seasons 1932 and 1934)	+ 17·15 (2)	—
Dung (season 1935)		

(The figures in brackets show the number of centres over which the means are taken.)

Here again, as in the Norfolk trials, superphosphate and sulphate of ammonia in moderate amounts produced very little effect. Potash also had little influence on the proportion of ware at the centres that showed no response to potash in the actual yield of crop, possibly because the percentage of ware was usually already high. At centres where potash increased the crop, however, it also produced a very striking increase in the percentage of ware, as in the Devonshire experiments. The difference between the results relating to dung is probably due to the fact that in the 1933 and 1934 trials the mean percentage of ware was approximately 90 per cent., and little further increase was possible, whereas in the 1935 trials it was only just over 70 per cent.

The evidence from the three sets of figures seems to suggest that, in general, superphosphate exerts very little influence on the percentage of ware, whilst sulphate of ammonia in moderate amounts usually has a slightly greater effect than superphosphate, and occasionally, as in the Devonshire trials, may give a very striking result. Potash, on the other hand, seems to have been more generally successful in bringing about a substantial increase in the proportion of tubers of ware size, and was usually effective under circumstances in which potash increased the yield of the crop as a whole. That dung should produce such a marked effect in three out of five experiments is interesting, and serves to emphasize both the importance of dung to the potato crop and that, where only a light dressing of dung is available, special care should be taken to ensure a good supply of potash, as well as nitrogen, in the artificial fertilizer mixture.

Climatic conditions will always exert a considerable influence on both yield and size of tubers, but the grower who is frequently troubled with a high proportion of tubers below

NOTES ON MANURING

ware size, might obtain some improvement by reconsidering both the size and spacing of the sets and also the "balance" of his manuring.

Fertilizers for Sugar-Beet. The response, or lack of response, by this crop to artificial fertilizers has created much controversy, and, in some quarters, considerable disappointment. Experiments in which sugar-beet has shown a response to treatment with fertilizers are not entirely lacking, however, and there is no shortage of instances in which attempts to grow sugar-beet on land in poor condition, with little or no manuring, have definitely failed. Nevertheless, experience suggests that soil conditions, tilth, careful hoeing, and, in general, the efficient execution of all work at the time when the crop is just at the right stage to benefit by it, all exert an overwhelming influence on the final yield, far more so than with many other crops. That artificial fertilizers will be largely wasted if cultivations are not performed efficiently and at the right time is probably true of most crops, but it is an absolute certainty with the sugar-beet crop. Again, the influence of climatic conditions on yield is very great. No amount of fertilizer can produce the large effects on yield, on land in reasonably good heart, that season alone may induce. Many growers have had experience of this in the past two seasons, but the effects of season and cultivation do not constitute reasonable grounds for the neglect of adequate manuring.

Most people agree that, on the average of a period of years, sugar-beet will give a profitable response to nitrogenous fertilizer up to about 3 cwt. per acre. This was the result obtained in nine years' trials at Sprowston. From other trials at the same centre there is some evidence that, on the basis of equal quantities of nitrogen, nitrate of soda is slightly more efficient than sulphate of ammonia and, in general, especially on light soils likely to respond to potash, one cwt. of either of these two fertilizers can be regarded as about equal in value for sugar-beet, despite the slightly higher nitrogen content of the sulphate of ammonia.

The position with regard to phosphate and potash is not so clear, however, for many experiments have failed to show any significant effect on yield from the use of fertilizers supplying either of these two plant foods. Nevertheless, sugar-beet seedlings grow away better, and come to the hoe

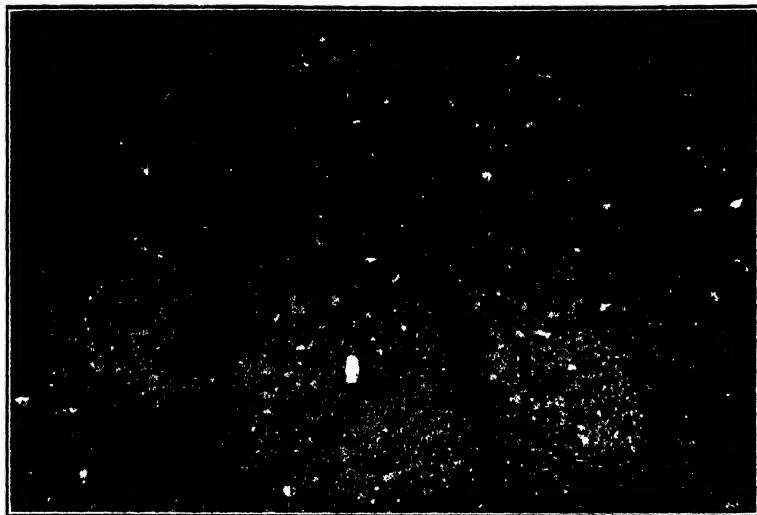
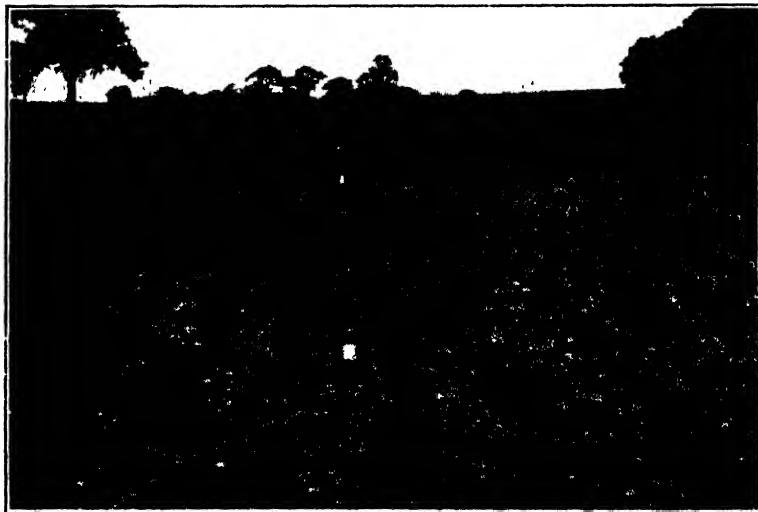


FIG. 1. Effect of phosphate on growth of sugar-beet seedlings. The plot on the left side of the photo received 6 cwt. per acre of superphosphate, and that on the right received no phosphate.



Photos F. Hanley

FIG. 2. Effect of phosphate on early growth of sugar-beet on soil in a normal state of fertility. As often happens in these circumstances, the effect became less obvious as the season advanced (photo taken at Sprowston, Norfolk, June 10, 1936. Right of first peg received 6 cwt. of superphosphate per acre; left of first peg received no superphosphate).



Photos F Hanley

Figs. 3 (*above*) and 4. - Effect of superphosphate on growth of sugar-beet on soil low in phosphate. The effect became more pronounced as the season advanced. Photograph taken in East Norfolk, showing the same plots on two different dates. No. 3 on June 8, and No. 4 on June 19, 1936. Of the plots in the foreground, the left received 6 cwt per acre of superphosphate and the right received no phosphate.

NOTES ON MANURING

more quickly and more uniformly, in the presence of a moderate dressing of phosphatic fertilizer, and, though this may not always result in a bigger crop, there are years and circumstances in which such an improved growth in the early stages is welcome. For instance, it may enable the crop to grow more quickly through the stage when it is most vulnerable to attack by some insect pest or fungoid disease, leaving a moderately full plant despite the presence of the pest. Again, early brairding enables hoeing to begin early and thereby facilitates the control of weeds. The very serious results that follow definite phosphate deficiency make it worth while to supply some phosphate if there is any doubt at all about the adequacy of the phosphate residues in the soil.

If a grower has used phosphates fairly liberally in recent years he will probably require to use no more than 2-3 cwt. per acre of superphosphate for the sugar-beet crop. Even on land that has been well done in the past, however, this small quantity seems to give a slight impetus to the young seedling—an effect that can often be seen at brairding. There are circumstances, however, in which more than the equivalent of 2 cwt. per acre of superphosphate is desirable, for example: (1) in districts where it is the practice to apply to the root crop sufficient phosphatic fertilizer for the whole rotation; (2) where deep ploughing is being practised for the first time; and (3) where economy in the use of artificial fertilizers during past years has brought about a serious reduction in the phosphate reserves in the soil. When looking at the financial side of the problem it must be remembered that, if the application of phosphate for the root crop is cut down, an additional application may have to be made somewhere else in the rotation for the other crops. Admittedly there seems little point in giving heavy dressings of phosphate to the sugar-beet crop if they are really intended for some subsequent crop, for even if there is little loss by leaching, the phosphate may be converted into some complex form in the soil, and become less readily available and therefore less effective, for the later crop for which it is intended. If, however, the phosphatic dressing for the sugar-beet crop is reduced, it is essential that steps be taken to ensure that subsequent crops do not suffer in consequence.

The response obtained from applications of potassic fertilizer has been relatively disappointing in so far as actual effect on yield of beet is concerned. There does, however,

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seem to be a definite connexion between nitrogen and potash —a connexion that is becoming more firmly established as additional experimental results become available, particularly in relation to the sugar content of the beet. There seems no doubt that, on many soils, especially sands and chalks, some potash should be included in the sugar-beet manure, and though the quantity may vary with soil type, an application of 2-3 cwt. per acre of 30 per cent. potash salts, or an equal amount of potash in some other form, is likely to prove worth while.

A growing tendency to sow fertilizer and seed together, using only one drill, has little experimental evidence to commend it for the sugar-beet crop at present. Where seed and fertilizer are sown down the same coulter there is risk of delayed germination, especially under any but moist seed-bed conditions. The risk is increased if potash salts, muriate of potash or kainit be included in the manure mixture. There is less risk, however, when a proper seed and manure drill is used, especially where the seed and fertilizer are delivered down separate coulters, the fertilizer being deposited rather deeper than the seed and separated to some extent from direct contact with it. Small dressings of certain fertilizers distributed with this type of drill are often held to be beneficial to seedling growth, e.g., about 2 cwt. per acre of bone super-phosphate is often used in this way by fenland growers, though fenland seed-beds, needless to say, are usually well supplied with moisture. It may be that small quantities of certain fertilizers will prove beneficial when placed near the seed, but the practice involves some risk, varying with the type of fertilizer, the quantity used and the soil conditions at the time. More definite information is required on these points.

NOTES ON FEEDING

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THE current issue of the *Journal of Agricultural Science* is largely devoted to reports on experimental work dealing with practical nutrition problems, the main features of which are summarized below.

Grass Silage. Two lengthy communications by Dr. S. J. Watson and Mr. W. S. Ferguson, of the research staff of Imperial Chemical Industries, Ltd., embody the results of a very large volume of experimental work dealing with the losses of nutritive material involved in the ensilage of grass by various processes, and with the chemical composition of the different products.

The control of the ensilage process depends upon the compaction of the material and exclusion of air to as great a degree as possible, and the rapid acidification of the mass through the production of lactic acid. When the material is relatively loosely packed the enclosed volume of air is large, fermentation is vigorous, the temperature rises to 120° F. or more, and the loss, particularly of carbohydrates, is high. Better compaction, as secured by chaffing the material and packing it tightly by heavy trampling or other pressure devices, makes it possible to keep down the maximum temperature, with consequent reduced losses and a better product.

With materials, such as young grass, that are comparatively rich in protein, and consequently not rich in fermentable carbohydrates, it is not always possible to get a sufficiently rapid formation of lactic acid, and, therefore, either the lactic fermentation must be stimulated by an addition of fermentable carbohydrates, or the desirable degree of acidity must be secured by appropriate additions of acid. The latter method is that adopted in the now familiar A.I.V. process in which the material is watered with a dilute solution of mineral acids during the process of filling. For the purpose of the alternative type of method molasses forms a useful source of carbohydrate that can be conveniently distributed through the mass of ensiled material. Whey has also been used for this purpose, but only with success when applied in relatively concentrated form.

The data reported by the Jealott's Hill workers came from

NOTES ON FEEDING

258 samples of ensiled grassland herbage, of which 65 samples were produced by the ordinary method without additions, 38 with added molasses, 4 with added whey, and 143 by the A.I.V. process. Data on a few silages made from other materials are also included in the report. The chemical nature of the products was examined in considerable detail, but we can only touch here upon some of the observations that are of direct practical interest.

The external characteristics of the silages varied with the acidity of the material, the more acid samples retaining to some extent the green colour of the grass and giving off only a faintly acid smell, whilst at the other extreme the silages of low acidity were dark brown in colour and strong smelling. The molassed silage is very favourably reported on as having at all acidities the characteristic sweet odour of the molasses, without any tinge of butyric acid. The smell of the A.I.V. silage was more variable, being quite pleasant at the higher acidities, but increasingly like that of ordinary silage as the acidity fell. The general conclusion is drawn, however, that ensilage of grass by the A.I.V. process " results in the production of a foodstuff of excellent quality, in which the breakdown of protein and the formation of organic acids, which is so characteristic of ordinary silage, is markedly reduced, though not to the extent which might be expected."

A much less favourable conclusion is drawn as to the merits of the ordinary process of ensilage, especially for the younger types of grass material in which the crude-protein content is relatively high.

The highest commendation is given to the molasses process, in which 15-25 lb. of molasses, suitably diluted with water, was used per ton of fresh grass. Whilst superior in general attractiveness this type of silage was " little inferior in its chemical characteristics to that produced by the A.I.V. process." The chief disadvantage is apparently that the breakdown of protein is rather greater than that obtaining with the A.I.V. process. The use of molasses is nevertheless recommended where silage of high-protein content is made. Considerable stress is placed upon the exercise of the greatest care in trampling the fodder, teasing it out, and allowing time in filling for individual layers, particularly in the bottom of the silo, to warm up to about 80° F. " No process that can be devised will be of any value where such precautions are not exercised."

NOTES ON FEEDING

The study of the losses of nutrients incurred in the conversion of grass into silage by the different processes led to the conclusion that, whilst some reduction of loss is effected by the molasses and A.I.V. treatments as compared with the ordinary method, the differences are of no great practical significance, since the losses in the ordinary method, properly applied, can be kept down to a low level, even where material of fairly high protein content is used. The real advantage of the other methods lies in the greater reliability of the product.

As between these two methods, there is little to choose on grounds of efficiency of food conservation and quality of product; but on grounds of cost, safety and convenience of application the advantage lies definitely with the molasses process. Neither process need be considered if the crop to be ensiled is at a fairly advanced stage of growth.

Digestibility of Wheat Offals by Poultry. Amongst poultry farmers, the merits for poultry feeding of the various by-products from the milling of wheat form the subject of perennial controversy, which reaches its peak of intensity with reference to the precise value of bran. Practical experience in the use of these products is extremely variable according to the conditions under which they are used, and points almost with certainty to the conclusion that their full nutritive effects—especially in regard to bran—cannot be expressed in the terms of the conventional chemical analysis and of estimates based thereon.

It is none the less true, however, that in so far as the nutritive effects are determined by the amount of energy that the food can place at the disposal of the animal, this part—usually by far the greatest part—of the nutritive effect is measured by the available energy of the digested organic matter.

The study of poultry nutrition problems is hampered by the relative paucity of data as to the digestibility by poultry of the various feeding stuffs commonly used, and all too frequently recourse must be had to the unsatisfactory expedient of using digestion coefficients arrived at in experiments with other classes of animals.

A few years ago Halnan gave us data for the digestibility of several varieties of wheat, and he has now supplemented these data by further measurements of the digestibility by the fowl of samples of broad bran, pollards, and fine middlings.

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From the composition quoted in the report the "fine middlings," with only 8·38 per cent. of protein and 1·92 per cent. of fibre, would appear to have been almost a flour, but the data for the other two products stamp them as typical of bran and straight-run pollards.

In each instance separate data were obtained from four birds (Light Sussex cockerels) and the average digestion coefficients summarized below were arrived at:—

		Bran	Pollards	Fine Middlings
		%	%	%
Total Organic Matter ..	..	39·4	63·2	84·6
Crude Protein ..	..	60·5	80·0	71·5
Ether Extract ..	..	53·3	79·5	92·9
Crude Fibre ..	..	9·2	5·4	3·4
Nitrogen-free Extract ("Carbohydrates") ..	..	38·7	63·4	88·0

Having in mind that the pig will commonly digest about 65 per cent. of the organic matter of bran the low figure shown by the poultry is very striking, as also is the very low digestibility of the fibre. It will also be noted that as one passes from the bran to the less fibrous foods the digestibility of all the ingredients other than fibre rises considerably, this effect being marked also as between the pollards and the middlings. That the presence of fibre in poultry feeding stuffs leads to a depression of digestibility of the other ingredients has indeed been noted in previous experiments.

From these experiments it would appear that as a source of energy for poultry the finer grades of wheat offals are considerably superior to bran, the relative energy values (expressed as starch equivalents per 100 lb. of dry matter) being 38 lb., 64·4 lb., and 85·4 lb. for the bran, pollards, and fine middlings respectively. The finer offals are in fact utilized quite as efficiently by poultry as by other farm animals.

That the digestibility of bran may vary appreciably according to its fibre content is illustrated by the following data from a recent Swedish publication.

	..	Low Fibre	Normal Fibre	High Fibre
		%	%	%
Total Fibre Content ..	..	8·4	9·4	10·4
		<i>Digestible Coefficients (Ruminants)</i>		
Organic Substance ..	..	74·9	70·7	65·2
Crude Protein ..	..	80·9	77·6	74·3
Ether Extract ..	..	83·6	81·0	79·2
Crude Fibre ..	..	55·0	47·5	40·0
Nitrogen-free Extract ..	..	75·5	72·0	66·6

NOTES ON FEEDING

It will be noted that with rising fibre content the digestibility of each ingredient falls, and that the general digestibility, as measured by the organic matter, falls about 5 per cent. for each 1 per cent. increase in the fibre content of the bran.

Digestibility of Molassed Sugar-Beet Pulp by Poultry. In a second report, Halnan gives the results of tests of the digestibility of this feeding stuff by poultry. Experience in its use with other classes of live stock has been almost uniformly favourable, and in view of its relatively low price, and bulk-producing property when mixed with water, its potentialities for poultry feeding obviously need to be examined at the present time.

Unfortunately Halnan's results do not afford much encouragement, since the average digestibility (by four birds) of the organic matter of the dried pulp amounted to no more than 17·5 per cent. Protein was 33·5 per cent. digestible and nitrogen-free extractives 22·1 per cent. digestible, but the digestibility of the fibre and ether extract were so low that they could not be measured. It is almost certain as Halnan points out, that the conditions under which the trials had to be undertaken would tend to undervalue the digestibility of the pulp, but clearly a very large error would have to be assumed to raise the food out of the category of low digestibility. The results are surprising, in view of the very favourable results obtained by Woodman with pigs, and further tests are desirable before a final judgment is pronounced. Such tests might also be extended to explore the possibility of the development of fishy taint in the egg, such as has occasionally been observed in the milk from cows receiving rather large quantities of molassed beet pulp.

PRICES OF FEEDING STUFFS

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
Wheat, British.. ..	£ s. 9 0	£ s. 0 8	£ s. 8 12	72	s. d. 2 5	d. 1·29	% 9·6
Barley, British feeding ..	8 15	0 8	8 7	71	2 4	1·25	6·2
.. Argentine ..	8 13	0 8	8 5	71	2 4	1·25	6·2
.. Danubian ..	8 5*	0 8	7 17	71	2 3	1·20	6·2
.. Persian ..	8 2*	0 8	7 14	71	2 2	1·16	6·2
.. Polish ..	8 12§	0 8	8 4	71	2 4	1·25	6·2
Oats, English, white ..	8 13	0 9	8 4	60	2 9	1·47	7·6
.. black & grey	8 13	0 9	8 4	60	2 9	1·47	7·6
.. Scotch, white ..	9 13	0 9	9 4	60	3 1	1·65	7·6
.. Canadian, mixed feed	7 15	0 9	7 6	60	2 5	1·29	7·6
Maize, Argentine ..	5 17	0 7	5 10	78	1 5	0·76	7·6
.. Danubian Gal. Fox	6 8†	0 7	6 1	78	1 7	0·85	7·6
.. South African No. 2 white flat	7 0†	0 7	6 13	78	1 8	0·89	7·6
Beans, English, Winter	7 0§	0 17	6 3	66	1 10	0·98	19·7
Peas, English, blue ..	11 5§	0 14	10 11	69	3 1	1·65	18·1
.. Japanese ..	26 10†	0 14	25 16	69	7 6	4·02	18·1
Dari	8 10†	0 8	8 2	74	2 2	1·16	7·2
Milling Offals :—							
Bran, British ..	8 2	0 15	7 7	43	3 5	1·83	9·9
.. broad ..	8 12	0 15	7 17	43	3 8	1·96	10
Weatings†	8 0	0 12	7 8	56	2 8	1·43	10·7
.. Superfine‡	8 10	0 13	7 17	69	2 3	1·20	12·1
Pollards, imported ..	7 15	0 12	7 3	50	2 10	1·52	11
Meal, barley	9 17	0 8	9 9	71	2 8	1·43	6·2
.. grade II ..	9 2	0 8	8 14	71	2 5	1·29	6·2
.. maize ..	6 12	0 7	6 5	78	1 7	0·85	7·6
.. germ ..	6 15	0 11	6 4	84	1 6	0·80	10·3
.. locust bean ..	7 15	0 5	7 10	71	2 1	1·12	3·6
.. bean	8 10	0 17	7 13	66	2 4	1·25	19·7
.. fish	14 15	2 2	12 13	59	4 3	2·28	53
Maize, cooked, flaked ..	7 4	0 7	6 17	84	1 8	0·89	9·2
.. gluten feed ..	7 0	0 13	6 7	76	1 8	0·89	19·2
Linseed cake—							
English, 12% oil ..	10 2	1 0	9 2	74	2 6	1·34	24·6
.. 9%	9 10	1 0	8 10	74	2 4	1·25	24·6
.. 8%	9 5	1 0	8 5	74	2 3	1·20	24·6
Cottonseed cake, English, Egyptian seed, 4½% oil ..	5 17	0 18	4 19	42	2 4	1·25	17·3
Cottonseed cake, Egyptian, 4½% oil ..	5 7	0 18	4 9	42	2 1	1·12	17·3
Cottonseed cake, decorticated, 7% oil	9 0†	1 8	7 12	68	2 3	1·20	34·7
Cottonseed meal, decorticated, 7% oil	9 0†	1 8	7 12	70	2 2	1·16	36·8
Coconut cake, 6% oil ..	7 10	0 18	6 12	77	1 9	0·94	16·4
Ground-nut cake, decorticated, 6-7% oil	8 10†	1 8	7 2	73	1 11	1·03	41·3

PRICES OF FEEDING STUFFS (*continued*)

Description	Price per ton	Manuri- al value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
Ground-nut cake imported, decorti- cated, 6-7% oil ..	£ 8 12	£ 1 8	7 4	73	2 0	1.07	41.3
Palm-kernel cake, 4½-5½% oil	7 15†	0 12	7 3	73	2 0	1.07	16.9
Palm-kernel cake meal, 4½% oil	7 12†	0 12	7 0	73	1 11	1.03	16.9
Palm-kernel meal, 1-2% oil	7 5	0 12	6 13	71	1 10	0.98	16.5
Feeding treacle	5 0	0 8	4 12	51	1 10	0.98	2.7
Brewers' grains, dried ale	6 7	0 11	5 16	48	2 5	1.29	12.5
Brewers' grains, dried porter	6 0	0 11	5 9	48	2 3	1.20	12.5
Dried sugar-beet pulp	5 2	0 5	4 17	66	1 6	0.80	5.2

* At Bristol.

§ At Hull.

† At Liverpool.

† In these instances manurial value, starch equivalent and protein equivalent are provisional.

NOTE : The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex-mill or store. The prices were current at the beginning of February, 1937, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £11 per ton, then since its manurial value is £1 per ton as shown above, the cost of food value per ton is £10. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 8d. Dividing this again by 22.4, the number of pounds of starch equivalent in one unit, the cost per lb. of starch equivalent is 1.43d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices :—N., 7s. 2d.; P₂O₅, 2s. 3d.; K₂O, 3s. 6d.

FARM VALUES OF FEEDING STUFFS

The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

		Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported) ..	..	71	6·2	8 8
Maize ..	..	78	7·6	5 17
Decorticated ground-nut cake ..		73	41·3	8 11
" cotton-seed cake ..		68	34·7	9 0
(Add 10s. per ton, in each instance, for carriage.)				

The cost per unit starch equivalent works out at 1·93 shillings, and per unit protein equivalent 1·31 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The " food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the November, 1936, issue of the Ministry's JOURNAL, p. 816).

FARM VALUES.

Crop		Starch equivalent	Protein equivalent	Food value per ton, on farm
		Per cent.	Per cent.	
Wheat ..	..	72	9·6	7 12
Oats ..	..	60	7·6	6 6
Barley ..	..	71	6·2	7 5
Potatoes ..	..	18	0·8	1 16
Swedes ..	..	7	0·7	0 14
Mangolds ..	..	7	0·4	0 14
Beans ..	..	66	19·7	7 13
Good meadow hay ..	..	37	4·6	3 17
Good oat straw ..	..	20	0·9	2 0
Good clover hay ..	..	38	7·0	4 3
Vetch and oat silage ..	..	13	1·6	1 7
Barley straw ..	..	23	0·7	2 5
Wheat straw ..	..	13	0·1	1 5
Bean straw ..	..	23	1·7	2 7

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d., post free 7d.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton (2,240 lb.) during week ended Feb. 17.				
	Bristol	Hull	L'pool	London	Cost per Unit||
Nitrate of Soda (N. 15½%) ..	£ s. 7 12d	£ s. 7 12d	£ s. 7 12d	£ s. 7 12d	s. d. 9 10
" " Granulated (N. 16%) ..	7 12d	7 12d	7 12d	7 12d	9 6
Nitrate of Lime (N. 13%) ..	7 od	7 od	7 od	7 od	10 9
Nitro-Chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of Ammonia:-					
Neutral (N. 20.6%) ..	7 3d	7 3d	7 3d	7 3d	7 0
Calcium Cyanamide (N. 20.6%)	7 2e	7 2e	7 2e	7 2e	6 11
Kainite (Pot. 14%) ..	2 18	2 15	2 15	2 15	3 11
Potash Salts (Pot. 30%) ..	5 0	4 17	4 15	4 17	3 3
" " (Pot. 20%) ..	3 15	3 12	3 12	3 12	3 7
Muriate of Potash (Pot. 50%) ..	8 3	8 1	7 17	8 1	3 3
Sulphate .. (Pot. 48%) ..	9 15	9 13	9 9	9 13	4 0
Grd. Rock Phosphate (P.A. 26-27½%) ..	2 12a	2 10a	2 10a	2 5a	1 8
Superphosphate (S.P.A. 16%) ..	3 4	..	3 3f	3 0g	3 9
" " (S.P.A. 13½%) ..	3 1	2 17	2 19f	2 16g	4 1
Bone Meal (N. 3½%, P.A. 20½%) ..	—	6 10	7 oh	6 15	—
Steamed Bone Flour (N. 1% P.A. 27½-29½%) ..	5 5f	5 10	5 oh	5 0	—

Abbreviations : N = Nitrogen ; P.A. = Phosphoric Acid ;
 S.P.A. = Soluble Phosphoric Acid ; Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage-paid prices.

§ Prices are for not less than 2-ton lots, nett cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. prices.

a Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 5s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra, for lots of 10 cwt. and under 1 ton 15s. extra, and for lots of less than 10 cwt. but not less than 2 cwt. 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails ; southern rails 1s. 3d. extra.

h Prices shown are f.o.r. Appleby Bridge.

i Prices shown are f.o.r. Newport, Mon.

|| These are calculated by regarding a ton as comprising 100 "units" (equal parts of 22.4 lb.) so that a fertiliser, for example, with 16 per cent. nitrogen, contains 16 such "units" in a ton. Then, if the price per ton of such a fertiliser be divided by the percentage figure, the deduced cost is that of a "unit" of that agent. Those in the table above are based on London prices. (For further explanation, see Advisory Leaflet No. 146, "The Valuation of Artificial Manures," obtainable from the Ministry, free of charge.)

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The Agricultural Index Number

THE January index number of prices of agricultural produce at 130 (base 1911-13 = 100) is 4 points above that of December, 1936, and 11 points higher than a year ago. (If allowance be made for payments under the Wheat Act, 1932, and the Cattle Industry (Emergency Provisions) Act, 1934, the revised index becomes 133.) During the month under review wheat, barley, oats, fat cattle and sheep, hay and wool realized higher prices than in December, but fat pigs, eggs, butter, cheese and potatoes sold at lower rates.

Monthly index numbers of prices of Agricultural Produce. (Corresponding months of 1911-13 = 100.)

Month	1932	1933	1934	1935	1936	1937
January	122	107	114	117	119	130
February	117	106	112	115	118	—
March	113	102	108	112	116	—
April	117	105	111	119	123	—
May	115	102	112	111	115	—
June	111	100	110	111	116	—
July	106	101	114	114	117	—
August	105	105	119	113	119	—
September	104	107	119	120	127	—
October	100	107	114	113	125	—
November	101	109	114	113	125	—
December	103	110	113	114	126	—

Revised monthly index numbers of prices of Agricultural Produce, allowing for payments under the Wheat Act (a) and the Cattle Industry (Emergency Provisions) Act (b).

Month	1932	1933	1934	1935	1936	1937
January	—	111	119	124	125	133
February	—	110	117	122	123	—
March	—	106	112	118	122	—
April	—	109	116	126	128	—
May	—	105	116	117	120	—
June	—	104	114	117	121	—
July	—	104	117	120	121	—
August	108	108	122	120	124	—
September	108	111	125	128	133	—
October	104	112	121	119	129	—
November	105	113	120	119	129	—
December	107	114	120	120	130	—

(a) Commenced August, 1932. (b) Commenced September, 1934.

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Grain. Wheat at an average of 9s. 9d. per cwt. was 1s. 1d. higher than in December, and the index moves upwards by 15 points to 133. (If the "deficiency payment" under the Wheat Act, 1932, is taken into consideration the figure becomes 134.) Prices of barley and oats also appreciated, the former rising from 9s. 6d. to 10s. per cwt. and the latter from 7s. 1d. to 8s. 2d., the indices at 125 and 120 showing advances of 10 points and 19 points respectively. In January, 1936, wheat averaged 6s. 3d., barley 8s. 1d., and oats 5s. 11d. per cwt., the relative indices being 85, 101, and 87.

Live Stock. Quotations for fat cattle continued to rise, and the average of second quality at 33s. 1d. per live cwt. was 6d. more than in the previous month; this increase, taken in conjunction with the fall in price which took place during the base period, results in the index moving from 91 to 97. The addition of the subsidy under the Cattle Industry (Emergency Provisions) Act, 1934, brings the index up to 112. Fat sheep at an average of 10½d. per lb. for second quality compared with 10½d. in December; here, again, in consequence of a decline in the base price, the index at 140 shows an increase of 12 points. Baconers at 12s. 4d. and porkers at 13s. 6d. per score (20 lb.) were lower on the month by 1d. and 9d. per score respectively, but, owing to a greater decline in the corresponding price of 1911-13, the index for baconers rises 6 points to 130, while that for porkers remains unchanged at 131.

Both dairy cows and store cattle were cheaper, but only in the case of the latter is the index altered, viz., from 98 to 99. Store sheep realized more money, the index at 118 showing an increase of 5 points, but store pigs declined in price and the index falls from 156 to 152.

Dairy and Poultry Produce. No change occurred in the regional price of liquid milk between December and January, and the index continues at 171. Butter averaged 1s. 2d. per lb. compared with 1s. 2½d. in the previous month, with a consequent fall of 3 points in the index to 95. At 12s. 3d. per 120, eggs were cheaper by 5s. 8d., and the index declines from 106 to 95. Quotations for cheese were slightly reduced, the rise of 4 points in the index to 107, however, being the result of a greater decline recorded during the base years. Prices of all descriptions of poultry were firm and, although the relative indices moved irregularly, the combined index at 120 is 1 point higher than in December.

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Other Commodities. At £7 16s. 6d. per ton potatoes were only 1s. per ton lower than in December, but as a rise took place between December and January of 1931-32 the index falls from 220 to 205. Clover and meadow hay rose in price to a small extent, but insufficiently to change the combined index of 98. At 1s. 4½d. per lb. wool showed an increase of 1d. per lb., and the index at 131 is higher by 13 points.

Monthly index numbers of prices of individual commodities. (Corresponding months of 1931-32 = 100.)

Commodity	1935	1936	1936			1937
	Jan.	Jan.	Oct.	Nov.	Dec.	Jan.
Wheat	65	85	113	114	118	133
Barley	103	101	119	115	115	125
Oats	100	87	99	98	101	120
Fat cattle	95	97	95	93	91	97
.. sheep	140	127	131	130	128	140
Bacon pigs	117	107	114	118	124	130
Pork	128	115	119	126	131	131
Eggs	95	115	141	111	106	95
Poultry	121	127	115	116	119	120
Milk	171	171	171	171	171	171
Butter	83	93	98	97	98	95
Cheese	97	93	101	107	103	107
Potatoes	121	201	202	209	220	205
Hay	101	83	102	102	98	98
Wool	88	96	102	107	118	131
Dairy cows	105	105	107	109	111	111
Store cattle	87	94	95	95	98	99
.. sheep	111	105	132	117	113	118
.. pigs	151	134	150	155	156	152

Revised index numbers due to payments under the Wheat Act and the Cattle Industry (Emergency Provisions) Act.

Wheat	118	124*	133*	131*	134*	134
Fat cattle	110	111	109	108	105	112
General Index	124	125*	129	129	130	133

* Superseding figure previously published.

The Agricultural Produce Index Number for 1936

THE recovery of agricultural prices which occurred in 1934 and 1935 was continued in 1936 when the index figure showed a rise over the preceding year of 5 points and reached 122. When allowance is made for payments under the Wheat Act,

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1932, and the Cattle Industry (Emergency Provisions) Act, 1934, the index for 1936 is further increased by 4 points to 126.

The continued fall in fat cattle prices was arrested, and the index number for 1936 was 5 points above that of 1935. Increased prices were also obtained for wheat, barley, fat sheep, fat pigs, potatoes, butter, cheese, eggs, wool, and vegetables. Milk prices remained constant, while lower prices were recorded for oats, hay, poultry, fruit, and beans.

The percentage increases or decreases in the index numbers for fifteen items as between 1935 and 1936 are set out below:

	<i>Increases Per cent.</i>		<i>Decreases Per cent.</i>
Wheat	40	Oats	5
Barley	4	Hay	8
Fat Cattle	5	Fruit	26
Fat Sheep	2		
Pig, Baconers	10		
Pigs, Porkers	6		
Potatoes	38		
Butter	8		
Cheese	15		
Eggs	7		
Wool	9		
Vegetables	13		

Grain. The price of home-grown wheat in January was 6s. 3d. per cwt.—or 1s. 6d. more than in January, 1935. This price was again recorded in March, but in all the other months of the year the price was above 6s. 3d. per cwt. In May it was 6s. 9d., in August 7s. 8d. The price fell to 7s. 4d. per cwt. in September, but increased in each of the remaining three months, to 8s. 8d. in December. The average price for the twelve months was 7s. 2d. per cwt., an increase of 2s. per cwt. compared with 1935. The index for the year at 95 was the highest since 1930, when the index stood at 105. If deficiency payments under the Wheat Act of 1932 are taken into account the index for 1936 becomes 123. Barley fell from 8s. 1d. in January to 7s. 4d. per cwt. in April, rose to 8s. 1d. in May, fell during June and July to 6s. 4d. in the latter month and then rose to 10s. 4d. per cwt. in September. From that month there was a steady fall to 9s. 6d. in December, the average for the year being 8s. 3d. per cwt. or 4d. more than the preceding twelve months. The index was 4 points higher at 104 and was thus, with the exception of 1934, the highest recorded since 1929. Oats showed a decline over the year. In January the price was 5s. 11d. per cwt.,

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or 11d. per cwt. less than in January, 1935. The price remained about the same until April and rose during the next four months, reaching 6s. 10d. per cwt. in August. In September the price was 6s. 7d., and from then onwards it rose to 7s. 1d. per cwt. in December. The price for the year was 6s. 4d. per cwt., or 4d. per cwt. less than for the year 1935. The annual index at 89 was 5 points below 1935, 1 and 9 respectively above 1934 and 1933, and 10 points below 1932.

Fat Stock. Quotations for fat cattle showed some improvement during the year compared with 1935. After remaining about the same for the first three months of the year, prices rose to a peak in June. From June to November there was a steady decline from 36s. 5d. to 31s. 3d. per live cwt. Prices recovered to 32s. 7d. in December. The annual average was 33s. 6d. per live cwt., compared with 31s. 10d. in 1935, and the index rose by 5 points to 96. If allowance is made for payments under the Cattle Industry Act, the index becomes 111.

The annual average price of fat sheep at 9½d. per lb. was ½d. per lb. higher than that for 1935 and the index rose from 127 to 130. This is the highest figure recorded since 1931. Monthly variations were smaller than in 1935, the highest price being 10½d. per lb. and the lowest 9½d. per lb. Both bacon and pork pigs improved in price in 1936. Bacon pigs rose in price from 10s. 2d. in January to 11s. 3d. per score (20 lb.) March, remained fairly stable up to September and then rose to 12s. 5d. per score at the end of the year. Porkers followed a somewhat similar course, the price in January and December being 11s. 10d. and 14s. 3d. per score respectively. The annual average price of baconers was 11s. 4d. per score and the index was 113. Thus, compared with 1935 the price rose by 1s. per score and the index by 10 points. Porkers increased on the yearly average by 8d. per score, and this led to an increase of 6 points in the index to 115.

Dairy and Poultry Produce. The average price of milk for the year was similar to that for 1935, and the index remained the same at 176. Prices of farm butter commenced at 13s. 9d. in January and fell to 11s. 3d. per 12 lb. by June. Thereafter was a fairly steady rise to 14s. 9d. at the end of the year. The year's average was 13s. per 12 lb., 1s. higher than in 1935, and the index rose by 7 points to 96, the highest since 1932. Cheese commenced at 68s. per cwt. in January and rose steadily to 77s. 6d. in August. There was a slight

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setback in the next two months, but at the end of the year the price was 78s. 6d. per cwt. The average price for the year was 75s., being 9s. 6d. higher than in 1935, with the result that the index rose by 13 points to 102. Egg prices fell during the first four months and then rose by 11s. 6d. per long hundred (120) during the period May to November. In December the price fell by 1s. 8d. to 17s. 11d. per long hundred. The yearly average was better by 1s. at 13s. 6d. per long hundred, compared with 1935, and the index rose by 8 points to 117. This is the highest index number for eggs since 1930. The combined index for poultry was 123, and thus showed a fall of 1 point compared with 1935.

Commodity	1931	1932	1933	1934	1935	1936
Wheat ..	76	78	70	64	68	95
Barley ..	100	96	100	109	100	104
Oats ..	88	99	80	88	94	89
Fat Cattle ..	122	115	101	99	91	96
Fat Sheep ..	133	97	110	127	127	130
Pigs, Baconers ..	107	91	102	112	103	113
Pigs, Porkers ..	123	98	109	120	109	115
Hay ..	86	69	70	91†	97	89
Potatoes ..	188	197	104	119	133	184
Milk ..	147	144	150	163	176	176
Butter ..	111	102	94	87	89	96
Cheese ..	116	127	111	103	89	102
Poultry ..	144	128	126	120	124	123
Eggs ..	116	109	105	102	109	117
Fruit ..	132	180	143	129	196	145
Wool ..	52	45	66	80	80	87
Beans ..	74	76	72	75†	77†	76
Vegetables ..	140	153	141	143	137	155
Hops ..	77	99	173	102†	101†	102*
General Index ..	120	112	107	114	117	122

Revised index numbers due to payments under the Wheat Act and the Cattle Industry (Emergency Provisions) Act.

Wheat ..	—	100	128	121	116†	123*
Fat Cattle ..	—	—	—	104	106	111
General Index ..	—	114	111	119	123	126*

* Provisional.

† Superseding figure previously published.

Other Commodities. During the period January to June, the price of maincrop potatoes remained fairly constant between 154s. and 150s. 6d. per ton. Earlies realized

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154s. 6d. per ton in July and 88s. in August. Maincrop were selling at 110s. 6d. per ton in September and a rise occurred in each of the succeeding months, and by the end of the year the price was 157s. 6d. per ton. The average price for the year was 145s. per ton—an advance of 40s. over the previous year, and the index figure was 184 compared with 133 for 1935. Fruit showed a decline compared with 1935, the index number being 145 in 1936 as against 196 in 1935. The decline was attributable chiefly to the fall in the price of apples and plums. The combined annual average index for vegetables at 155 showed an increase of 18 points over 1935. This was mainly due to the higher prices of carrots, Brussels sprouts, and broccoli and cauliflower.

The index for hay at 89 was 8 points below that for the year 1935. The fall in price was more marked in meadow than in clover hay. The index for beans (for fodder), after rising in the two preceding years, fell in 1936 by 1 point to 76. Quotations for wool at the country market wool sales were higher on the average, and the index for the year rose from 80 to 87.

Trials of Potatoes for Immunity from Wart Disease, 1936

THE trials which are arranged each year by the Ministry with the object of testing new varieties of potatoes for immunity from Wart Disease, were again conducted in 1936 on the farm of the National Institute of Agricultural Botany, Ormskirk, Lancashire. The actual field operations and the taking of records were carried out by Mr. Harold Bryan, B.Sc., and Mrs. McDermott, of the Institute, but the trials were conducted on a plan approved by the Ministry.

Thirty-four stocks were included in the second and subsequent years' tests; one developed Wart Disease. Of the 35 entries for the first year's tests, 4 became infected in the field; 2 proved to be synonyms of existing varieties; 1 was too poor to judge, and 32 were distinct varieties.

As in previous years, the results of the trials have been considered by a small committee composed of representatives of the Ministry of Agriculture and Fisheries, the Department of Agriculture for Scotland and the Ministry of Agriculture for Northern Ireland, and co-ordinated with the results of the trials carried out by the two last-named Departments at Edinburgh and Kilkeel respectively.

The Committee recommended the approval of 22 new

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varieties, but none of these has actually been added to the approved list, inclusion having been postponed until such time as the raisers intimate that the varieties have actually been or will shortly be introduced into commerce. This intimation has been received in respect of five varieties which had been recommended for approval as the result of trials carried out in previous years and which are now being introduced into commerce: descriptions are given below.

A list of the names of the more commonly grown varieties which have been approved as immune from Wart Disease may be obtained on application to the Ministry.

SECOND EARLY VARIETIES.—Dunbar Rover

<i>Sprout.</i>	Pink.
<i>Tuber.</i>	Oval; skin white; flesh white; eyes shallow.
<i>Haulm and Foliage.</i>	Tall, upright; stems thick and strong, green, pink towards maturity, wing broad; leaf open; leaflets long and broad, ashy green, leaflet stalks long; secondary leaflets large and often borne on leaflet stalks.
<i>Flowers.</i>	White, large and profuse; flower stalks long and strong; buds fairly dark.

Gleniffer

<i>Sprout.</i>	Pink.
<i>Tuber.</i>	Kidney; skin white; flesh white; eyes shallow.
<i>Haulm and Foliage.</i>	Medium height, spreading; stems strong and branching; wing waved; leaf fairly rigid, close; leaflets small, pointed, with margins slightly waved, medium green and glossy but yellowing towards maturity, terminal leaflet markedly drooping; secondary leaflets fairly numerous and small.
<i>Flowers.</i>	Purple tipped white, profuse; buds dark; berries freely.

Ulster Monarch

<i>Sprout.</i>	Blue.
<i>Tuber.</i>	Kidney; skin white; flesh white; eyes shallow.
<i>Haulm and Foliage.</i>	Medium height, spreading, vigorous; stem branching, markedly hairy, wings broad and plain; leaflets large, medium green, waxy appearance, margins fluted, secondary leaflets inconspicuous.
<i>Flowers.</i>	White, not profuse; stalks short; buds green, usually drop off without opening.

EARLY MAINCROP VARIETY.—Early Pride.

<i>Sprout.</i>	Blue.
<i>Tuber.</i>	Kidney; skin white; flesh yellow; eyes shallow.
<i>Haulm and Foliage.</i>	Medium height, open, upright, weak; colour yellowish-green; leaf very short, top growth erect; leaflets small, cupped, terminal leaflet round; secondary leaflets small and numerous; wings crinkled; stems thin and numerous, deeply bronzed.
<i>Flowers.</i>	Light blue-purple, numerous.

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LATE MAINCROP VARIETIES.—Dunbar Archer

<i>Sprout.</i>	Blue.
<i>Tuber.</i>	Short oval ; skin white ; flesh white ; eyes shallow to medium.
<i>Haulm and Foliage.</i>	Tall, upright; stems very strong, branching freely, mottled, wing very wavy ; leaf rigid, leaf and leaflet stalks tinged pink ; leaflets medium green and pointed ; secondary leaflets numerous.
<i>Flowers.</i>	White, fairly profuse, anthers orange ; buds pink.

Dunbar Standard

<i>Sprout.</i>	Pink.
<i>Tuber.</i>	Long oval ; skin white ; flesh white ; eyes shallow
<i>Haulm and Foliage.</i>	Tall, upright and rigid ; stems very strong and branching, slightly tinged purple, wing broad and straight ; leaf rigid, leaflets large, medium to dark green, dull.
<i>Flowers.</i>	White ; anthers loose, flower stalks short ; buds medium green.

Agricultural Scholarships

THE Ministry invites applications for the under-mentioned scholarships which are being offered for award this year under the scheme of scholarships for the sons and daughters of agricultural workmen and others :—

Ten Senior Scholarships, tenable at Agricultural Colleges or University Departments of Agriculture, for diploma or degree courses in an agricultural subject, or at Veterinary Colleges for courses in veterinary science ;

Ten Extended Junior Scholarships (for those who have already held Junior Awards), and *120 Junior Scholarships*, tenable at Farm Institutes or similar institutions, for courses not exceeding a year in duration, in agriculture, horticulture, dairying, or poultry husbandry.

The scholarships are open to the sons and daughters of agricultural workmen or of working bailiffs, smallholders and other rural workers whose means and method of livelihood are comparable with those of agricultural workmen, and to persons who are themselves *bona fide* workers in agriculture. The value of the awards is such that neither the recipients nor their parents are normally required to make any contribution towards the cost of the training provided. The usual method of selection is by interview, no written examination being required, but candidates must be able to satisfy the Selection Committee that they are in a position to derive educational benefit from the proposed courses of

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instruction and must also intend to follow an agricultural pursuit on completion of their training.

The scheme under which these scholarships are awarded has now been in operation for 15 years, and assistance has been granted to over 1,600 persons. Many past students have succeeded in improving their positions substantially, and several hold important posts (scientific and otherwise) in the agricultural industry; for example, a smallholder's son now holds an appointment as Pathologist to a Colonial Research Institute; two former agricultural labourers have obtained posts as Marketing Assistant in the Agricultural Economics Department of a University and manager of a large farm respectively; a former dairymaid is now an Instructress at an Agricultural College. Of those who have been trained no fewer than 10 per cent. hold administrative, teaching, or research appointments of an agricultural nature, while a further 20 per cent. occupy posts of a supervisory character, such as managers of farms, nurseries, dairies, and so on. It will be seen, therefore, that the scholarships afford exceptional opportunities to those who are able to obtain them and take full advantage of the education provided.

Full information concerning the scheme, including forms of application and a leaflet outlining the types of career open to students who have completed courses of training, may be obtained from the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1, or locally from the offices of County Councils. The latest date for submitting applications is April 30, 1937.

Agricultural Wages Act, 1936 : Irish Free State

THE Agricultural Wages Act, 1936, which was passed by the Irish Free State Government in November last, provides for regulating the wages of agricultural workers and for setting up the organization necessary for this work. The executive functions under the Act are vested in a central Board (the Agricultural Wages Board), consisting of a Chairman, three neutral members, four employers' members, and four workers' members, all of whom are appointed by the Minister of Agriculture. With the exception of the Chairman, who holds office during the Minister's pleasure, members normally serve for three years. The presence of the Chairman at a meeting of the Board constitutes a quorum. Provision is

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made that when two or more ordinary members (i.e., other than the Chairman) are present at a meeting of the Board, including at least one workers' representative and one employers' representative, and all are in favour of making an Order, it shall be deemed to be made. If no more than one ordinary member is present the Chairman shall make the order, and in any other case the Chairman shall either make the order or adjourn its making to a future meeting. For administrative purposes the country is to be divided into a number of "wages districts" and these are to be grouped into "wages areas." An Agricultural Wages Committee will be appointed for each "wages area," and the Chairman of the Board will also be the Chairman of all such Committees. Each district within an area will be represented on the Committee for that area by not less than two members. Provision is made for equal representation of employers and workers on the Committees. All ordinary members of Committees are to be appointed by the Minister and to serve for one year.

The primary function of the Board is to fix minimum rates of wages for agricultural workers in respect of each wages district. Such rates may be fixed to apply universally to a district, or to any part of a district, or to special classes of workers, and subject to variation according to the period, hours or conditions of employment, or so as to provide for differential rates in respect of overtime employment. An order may define the benefits or advantages which may be reckoned in lieu of wages in cash, and the value at which they are to be reckoned. Before fixing or varying the minimum rates of wages, the Board is required to serve notice on the Wages Committee, for the area concerned, and the Committee may then, within two months, make recommendations, which the Board must take into consideration in making the order. Every order in regard to minimum wages must be laid before Dail Eireann as soon as made and that body may by resolution annul it within twenty-one days.

Where the Board is satisfied that a worker is incapable, by reason of physical injury or mental deficiency, or any infirmity due to age or to any other cause, of earning the minimum rate of wage, it must grant a Permit exempting him, on such conditions as may be prescribed in the Permit, from the minimum rate requirements. Other provisions relate to offences and legal proceedings under the Act, and the appointment and the powers of officers of the Board.

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Foot-and-Mouth Disease.—No further outbreaks of Foot-and-Mouth Disease occurred in the Derbyshire Infected Area after January 9, and, consequently, the Area was finally released from restrictions on January 30.

The Herefordshire Infected Area was contracted to approximately 5 miles round Donnington, Ledbury, on January 31, but owing to a further outbreak at Donnington on February 5 it has been necessary to maintain the restrictions over this 5 miles area for a further period. Provided that the disease position continues to be satisfactory, this area will be released from restrictions on February 27.

Farm Workers' Minimum Rates of Wages.—A meeting of the Agricultural Wages Board was held at Kings Buildings, Smith Square, London, S.W.1, on Tuesday, February 16, 1937, Mr. W. B. Yates, C.B.E., J.P., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages, and proceeded to make the following Orders :—

Cambridgeshire and Isle of Ely.—An Order fixing minimum and overtime rates of wages to come into force on March 1, 1937 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until February 28, 1938. The minimum rates are (1) for male workers of 21 years of age and over employed wholly or mainly as horsemen, cowmen and shepherds (other than workers employed solely as stockmen or yardmen), 39s. 6d. (instead of 38s. 6d. as at present) per week of the hours necessary for the performance of their customary duties ; (2) for other male workers of 21 years of age and over, 32s. 6d. (instead of 31s. 6d. as at present) per week of 48 hours in winter, except in the weeks in which Christmas Day and December 27, 1937, fall when the hours are 39 $\frac{1}{2}$, and 50 hours in summer, except in the weeks in which Good Friday, Coronation Day, Whit Monday and August Bank Holiday fall, when the hours are 42. Provision is made for an adjustment of the hours to meet cases where a holiday is given on July 26, 1937, instead of on August Bank Holiday. The overtime rates are 9*d.* per hour on weekdays (instead of 9*d.* per hour as at present), 11*d.* per hour on Sundays, Christmas Day, December 27, 1937, Good Friday, Whit Monday and August Bank Holiday (as at present) and 11*d.* per hour on Coronation Day ; and (3) for female workers of 18 years of age and over 6*d.* per hour with overtime at 7*d.* per hour as at present.

Middlesex.—An Order fixing minimum and overtime rates of wages to come into force on February 28, 1937 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until March 5, 1938. The minimum rates are (1) in the case of workers employed wholly or mainly on the duties of stockmen, for male workers of 21 years of age and over 43s. 9*d.* (instead of 42s. 6*d.* as at present) and for female workers of 18 years of age and over 31s. 3*d.* (instead of 30s. as at present) per week of 60 hours, except (a) in the week in which Christmas Day and Boxing Day fall together when the hours are 40, (b) in the weeks in which Christmas Day and Boxing Day fall when those days fall in separate weeks, when the hours are 50, (c) in the weeks in which Easter Monday, Coronation Day, Whit Monday, August Bank Holiday and any other bank holiday which may be proclaimed by Royal Proclamation fall when the hours are 50 ; (2) in the case of workers employed wholly or mainly as carters, for male workers of 21 years of age and over 40s. 10*d.* (instead of 39s. 8*d.* as at present) and for female workers of 18 years of age and over 29s. 2*d.* (instead of 28s. as at present) per week of 56 hours, except (a) in the week in which

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Christmas Day and Boxing Day fall together when the hours are 38. (b) in the weeks in which Christmas Day and Boxing Day fall when those days fall in separate weeks, when the hours are 47. (c) in the weeks in which Easter Monday, Coronation Day, Whit Monday, August Bank Holiday and any other bank holiday which may be proclaimed by Royal Proclamation fall when the hours are 47; (3) in the case of casual workers, for male workers of 21 years of age and over 8½d. per hour (instead of 8d. per hour as at present) and for female workers of 18 years and over 6½d. per hour (instead of 6d. per hour as at present), and (4) in the case of workers other than those specified above, for male workers of 21 years of age and over 36s. 5½d. (instead of 35s. 5d. as at present) in summer and 35s. (instead of 34s. as at present) in winter, and for female workers 26s. 0½d. (instead of 25s. as at present) in summer and 25s. (instead of 24s. as at present) in winter per week of 50 hours in summer, except in the weeks in which Easter Monday, Coronation Day, Whit Monday, August Bank Holiday and any other bank holiday which may be proclaimed by Royal Proclamation fall, when the hours are 42, and 48 hours in winter, except in the week in which Christmas Day and Boxing Day fall together when the hours are 30, and in the weeks in which Christmas Day and Boxing Day fall when those days fall in separate weeks when the hours are 39. The overtime rate for all male workers of 21 years of age and over is unchanged at 10½d. per hour, and for female workers of 18 years of age and over unchanged at 7½d. per hour.

Monmouthshire.—An Order fixing minimum and overtime rates of wages to come into force on March 16, 1937 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until September 15, 1937. The minimum rates for male workers of 21 years of age and over are 32s. 6d. (as at present) per week of 54 hours with overtime at 9½d. per hour on weekdays and 11½d. per hour on Sundays, Good Friday, Easter Monday, Whit Monday and August Bank Holiday (as formerly) and 11½d. per hour on Coronation Day.

Worcestershire.—An Order fixing minimum and overtime rates of wages to come into force on March 1, 1937 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until March 6, 1938. The minimum rates for male workers of 21 years of age and over are 31s. (as at present) per week of 52 hours in summer, except in the weeks in which Good Friday and Coronation Day fall when the hours are 43, and 48 hours in winter, except in the week in which Christmas Day falls when the hours are 39½, with overtime as at present and on Coronation Day at 9d. per hour. For female workers of 18 years of age and over, the minimum rate remains unchanged at 5d. per hour with overtime on Sundays and in excess of 8 hours on any other day at 5½d. per hour (as at present), and 5½d. per hour on Coronation Day.

Glamorganshire.—An Order fixing minimum and overtime rates of wages for workers (other than male workers employed wholly or mainly in forestry) to come into force on March 2, 1937 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until March 1, 1938. The minimum rates for male workers of 21 years of age and over employed wholly or mainly as stockmen, cattlemen, cowmen, horsemen, shepherds or bailiffs are 38s. (instead of 37s. as at present) per week of 60 hours with overtime unchanged at 10d. per hour, and for other male workers of 21 years of age and over 34s. 6d. (instead of 33s. 6d. as at present) per week of 52 hours in summer and 48 hours in winter, with overtime unchanged at 9d. per hour on week-

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days and 10d. per hour on Sundays. For female workers of 18 years of age and over the minimum rate remains unchanged at 6d. per hour with overtime rates also unchanged at 7d. per hour on weekdays and 7½d. per hour on Sundays.

Enforcement of Minimum Rates of Wages.—During the month ending February 12, 1936, legal proceedings were taken against ten employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow:—

Committee Area	Court	Fines Imposed	Costs Allowed	Arrears of Wages ordered	No. of workers involved
Derbyshire ..	Derby ..	£ 3 0 0	—	25 0 0	3
	Chesterfield ..	4 0 0	1 0 0	81 14 9	4
	Darlington ..	4 0 0	3 3 3	18 19 9	4
	Garstang ..	9 0 0	4 2 0	71 0 0	3
	Wragby ..	0 8 0	0 2 0	3 14 0	1
	Market Drayton ..	*	0 13 0	16 0 0	1
	Shrewsbury ..	1 10 0	0 10 0	8 15 0	1
	Bridgwater ..	5 0 0	0 7 6	18 15 5	1
	Llandovery ..	3 0 0	1 0 0	55 0 0	2
	Maesteg ..	*	0 13 0	6 0 0	1
		29 18 0	11 10 9	304 18 11	21

* Dismissed under the Probation of Offenders Act.

APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS: ENGLAND

Hertfordshire: Mr. J. Fowles, N.D.H., has been appointed Assistant Instructor in Horticulture, *vice* Mr. C. P. Quarrell, B.Sc.

Lancashire: Mr. H. Temperton, B.Sc.(Agric.), N.D.A., N.D.D., has been appointed Assistant Instructor in Poultry-keeping, *vice* Mr. G. M. Robertson, who will take up the post of Head Poultry Instructor on April 9 next when Mr. C. H. Dobbin retires.

Leicestershire: Mr. D. H. Findlay, B.Sc.(Agric.), N.D.A., N.D.D., has been appointed Agricultural Organizer, *vice* Mr. T. Hacking, LL.B., M.Sc., and will take up his duties on April 1 next.

WIRELESS TALKS TO FARMERS, MARCH, 1937

<i>Station and Date</i>	<i>Time : p.m.</i>	<i>Speaker</i>	<i>Subject</i>
National : March 1	6.20	Messrs. J. G. Stewart and F. Rayns	Sugar Beet.
.. 8	6.20	Messrs. J. G. Stewart and J. C. Wallace	Potatoes.
.. 15	6.20	Various	Debate from Bristol Studio.
.. 22	6.20	Mr. J. G. Stewart	Grass Mixtures. Lucerne and Sainfoin.
Midland : March 3	6.45	Our Country Correspondent : Mr. Walter Pitchford	Northamptonshire
.. 10	6.40	Mr. Henry G. Robinson	For Midland Farmers.
.. 15	7.30	Mr. Henry J. Massingham	Our Country Correspondent.
West : March 4	6.50	—	Fortnightly Letter to Western Farmers.
.. 8	6.0	From Seale-Hayne Agricultural College	Farming Feature.
.. 11	6.40	Messrs. A. W. Ling and W. D. Hay	For Western Farmers : What's Going on in Somerset?
.. 18	6.50	—	Fortnightly Letter to Western Farmers.
.. 25	6.40	Messrs. A. W. Ling and W. T. Price	For Western Farmers.
Week commencing March 28	—	—	Fortnightly Letter for Western Farmers.
North : March 12	6.25	Prof. J. A. Hanley and a Farmer	How I Started Farming.
.. 25	6.40	Mr. A. McVicar	Sugar Beet in Lincolnshire and Tweedside.
Welsh : March 2	8.0	Messrs. Moses Griffiths & R. J. Gardner (in Welsh)	For Welsh Farmers : Discussion on Different Types of Cows, Sheep and Pigs.
.. 19	7.30	Messrs. Moses Griffiths & Meurig Jones	For Welsh Farmers : The Union of Agriculturists in Wales.
Scottish : March 4	6.40	Mr. G. C. Middleton	For Scottish Farmers : The Live Stock Marketing Bill.
.. 10	6.50	Mr. Joseph F. Duncan	For Scottish Farmers.
.. 18	6.20	Mr. W. M. Findlay	For Scottish Farmers. Potato Growing.
Northern Ireland : March 5	7.30	Mr. R. F. Thompson	Care and Handling of Eggs for market.
.. 12 Week commencing March 28	7.30	Mr. Peter Fitzpatrick	Farmers' Work and Worry.
	—	" "	" "

NOTICES OF BOOKS

Fifty Years of Field Experiments at Woburn. By Sir E. John Russell, D.Sc., F.R.S., and Dr. J. A. Voelcker, C.I.E., M.A. Pp. xvii + 392; 48 figs. & 146 Tables. (London: Longmans, Green & Co. 1936. Price 21s.)

Four writers have had a hand in the compilation of this volume, which is the seventh in the series of Rothamsted monographs on Agricultural Science: Dr. J. A. Voelcker—the Voelckers, father and son, have been associated with Woburn since its inception as a research station in 1876—supplies the historical account and the description of the experiments; Mr. W. G. Cochran, of Rothamsted, examines the results statistically; Sir E. John Russell discusses their bearing on agricultural science and practice; and Dr. E. M. Crowther, also of the Rothamsted staff, adds as Part IV a chapter on the soils of the Woburn plots.

The mere mention of Woburn sends us back to the early days of agricultural research in this country when Rothamsted (1843) and Woburn (1876) comprised our all. Strangely, fate has cast Woburn for the minor rôle, for, as it would appear from this analysis of fifty years' work, the questions to which Woburn has furnished final answers are disappointingly few. They are clearest, perhaps, where they were less urgently needed, as on the continuous cropping plots, but have been either not forthcoming at all in such distinctively Woburn investigations as the experiments on Stackyard Field on the residual manurial values of cake and corn fed to animals, and the green manuring experiments, or only partially and unsatisfactorily because of the original plan of the field experimentation and subsequent alterations in the plots.

Yet the volume had to be written and it has its place. The results are collected, analysed by the new methods of statistics, and interpreted and applied. Woburn is added in compact form to the libraries of research and teaching stations for the specialists and students, but we do not count upon including, and spare him by excluding, the lay reader of agricultural literature.

Like the others of this series, the production of the book is first class.

Country Conditions. By Valentine Ackland. Pp. 126. (London: Lawrence & Wishart. 1936. Price 2s.)

With a good deal of restraint on her political bias, Miss Ackland might have produced a much more interesting and even more convincing account of conditions in rural Britain. Her obviously strong prejudices have severely weakened her book. The case for collective farming is not really assisted by sweepingly detrimental generalizations about farmers and landlords. The author has been unfortunate indeed if all the farmers of her acquaintance "have such a hatred of their own men that they will gladly be ruined themselves if that will bring about the ruin of the workers": such an attitude would, to say the least, be obviously short-sighted. Her review of rural life may be useful in some sense as a corrective to the "charmingly lyrical descriptions" of those "imaginative idealists" with whom she finds herself at issue, but it is not "a fair description of the English village to-day" to say that "housing conditions, if they have altered at all, must have altered for the worse" since 1840. Nor is it true that "conditions are hardly any better than they were in 1830"; although all who know the countryside intimately, whether they share Miss Ackland's views or not, will agree that much more remains to be done to ameliorate the lot of those who live and work on the land. This book must be read with a close watch on the author's international views.

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Practical Animal Husbandry. By William C. Miller, M.R.C.V.S., F.R.S.E., and E. D. S. Robertson, M.R.C.V.S. Second edition. Pp. xi + 427, and 180 figs. (Edinburgh : Oliver and Boyd. 1937. Price 15s.)

A scientific textbook can only continue to serve its purpose if subject to reasonably frequent revision. This manual of *Practical Animal Husbandry*, first published in 1934, now appears in a new edition containing over 100 pages of additional matter. The article on "Herd Management" has been revised by Mr. J. Mackintosh, who also contributes a section dealing with the Milk Marketing Board. Mr. H. R. Davidson has made important additions to the article on "Pig Management," and has supplied an article on the Pigs Marketing Board. The section on "Poultry-keeping" has been brought up to date by Miss E. Fergus, and Mr. N. Walker has contributed to the sections dealing with legislation affecting live stock. The articles on Rabbits and Fur-bearing Animals are by Dr. J. N. Pickard. The book is well illustrated and the information given should be of great assistance to veterinarians and stockowners.

An Introduction to the Scientific Study of the Soil. By Norman M. Comber. Pp. v + 206, and 25 figs. (London : Edwin Arnold and Co. 1936. Price 7s. 6d.)

Professor Comber's *Introduction to the Scientific Study of the Soil* needs no introduction to British readers. Since its first publication in 1927, it has established itself as a standard textbook for those who require in small compass a clear and concise account of the nature and principles of the modern study of soils. It is essentially a book for those who are making their first acquaintance with the subject, particularly students who are taking soil science as part of a general agricultural course, or as subsidiary to some special branch of agricultural science. It also serves to bring the state of modern soil studies to the knowledge of workers in other branches of science, as well as agricultural scientists whose student days lie far behind them.

In preparing the present edition, Professor Comber has been faced with the difficulty of selecting suitable material from the imposing volume of new work that has been done since the appearance of the second edition. A perusal of the book shows that this selection has been wisely exercised. The new material is concerned mainly with humus and with the mineral colloidal complex. The important chapter on soil water has been brought up to date by the inclusion of a lucid exposition of capillary potential and μF , and the section on field experimentation has also been modified.

Professor Comber has succeeded in presenting in some 200 pages an account of the essential features of the state of soil science at the close of 1936. This has only been possible by the use of that clarity and economy of expression of which he is such a master. He has performed a great service to the subject by presenting it in a form which makes possible its diffusion among a wide public.

Soil Erosion and its Control. By Quincy Claude Ayres. Pp. xi + 365, 234 figs. (London : McGraw-Hill Publishing Company, Ltd. 1936. Price 21s.)

During recent years the government and people of the United States have become acutely conscious of the dangers of soil erosion and of the necessity for its control. This is shown by the institution of the Soil Conservation Service in 1935. Publications dealing with this important subject are therefore of living interest.

The volume under notice is occupied principally with the description, often in considerable detail, of methods actually in use for the control

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of erosion and for the reclamation of land that has been damaged by erosion. The work is profusely illustrated with photographs and diagrams. The descriptions of methods are fully and clearly given, and one gains the general impression that the problem is being successfully tackled. The use of special implements, with or without power traction, is a notable feature.

Although the problem of soil erosion is of small magnitude in Great Britain, it is extremely grave in many parts of the Empire, notably in Africa. *Soil Erosion and its Control* will undoubtedly be of interest and value to those who have to cope with soil erosion overseas. The problem and its control are lucidly presented and the book may therefore be strongly recommended.

The Journal of the South-Eastern Agricultural College. Edited by the Rev. S. Graham Brade-Birks, M.Sc. (Manch.), D.Sc. (Lond.), F.Z.S. No. 39. Pp. 72. (Wye : South-Eastern Agricultural College, January, 1937. Price 2s. 6d., post free; residents in Kent and Surrey, 1s. 6d., post free.)

The current issue of this Journal contains reports of activities in connexion with advisory chemistry, agricultural economics, bacteriology, botany, entomology, hops, mycology, pig husbandry and veterinary science. The review of investigations on machinery used in spraying is continued. The general reader cannot fail to be impressed with the amount of research that is being carried on at Wye.

Our Natural Resources and their Conservation. Edited by A. E. Parkins and J. R. Whitaker. Pp. x + 650. (New York : John Wiley & Sons ; London : Chapman and Hall, 1936. Price 25s.)

This book is a contribution to the mass of semi-popular, semi-technical propaganda now being issued as an indispensable part of the great national effort to save America from the imminent destruction with which that country is threatened as a consequence of over-exploitation. Conservation has acquired a particular significance, almost synonymous with land salvation, in America. The idea of conservation is not new, but apart from spasmodic attempts by enlightened individuals, it was Theodore Roosevelt who first roused the people to its nation-wide importance. During his presidency attention was given mainly to plans for conserving mineral, forest and water resources. The high prices of the war and post-war period, however, encouraged waste on an unprecedented scale, and it needed the depression, and a series of droughts and spectacular dust storms to rouse the nation again to the much increased gravity of the situation. During Franklin Roosevelt's presidency conservation has become a political and social question of the first importance. The focal point has now shifted to the soil, the loss of which by erosion and exhaustion is infinitely more serious and irreparable than the wastage of underground wealth with which the former conservation movement was mainly concerned.

The earlier organizations, however, still exist, have sprung into greater activity than ever, and are reinforced by new organizations, particularly the Soil Conservation Service. Thus "conservation" in America now involves the preservation or rational utilization, with the needs of posterity in mind, of agricultural and pastoral land, of forests, of minerals and oil, of industrial products, of wild animals, of recreational resources (national parks), and finally of man himself regarded as the greatest national asset. The book deals with all these aspects of conservation, each chapter being written by an expert (22 in all) in his particular subject. It gives a most impressive picture of the magnitude of the national effort which ineluctable

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circumstances are compelling the American people to make in the interests of self-preservation. The effort is now only beginning, but the people are gradually becoming conscious that on its successful outcome more than on anything else depends the whole future of the United States.

Similar conservation movements, directed particularly against soil erosion, are developing in all the newer countries of the world, and in the U.S.S.R. and South Africa, as in the United States of America, have already become integral parts of national policy. Together they represent one of the most portentous movements of our time. They are moulding peoples into nations with a definite objective, and they are laying the foundations on which new civilizations may be built. In Great Britain we have husbanded our resources in the past and drawn largely on the fertility of other countries for our sustenance, so that soil exhaustion and erosion have been negligible, but in the Empire overseas they are matters of immediate and vital concern, and are bound ultimately to affect the relations between the component parts of the Commonwealth. Each country will have to adopt its own measures for dealing with the menace, but the pioneer work in America merits the closest study, not only for its scientific value but also as an outstanding example of national co-operation.

Regional Types of British Agriculture. Edited by J. P. Maxton, M.A., B.Sc., B.Litt. Pp. 318, & Maps. (London : George Allen and Unwin, Ltd. 1936. Price 12s. 6d.)

It is stated in the editor's preface that the original conception of this volume of essays was to provide an outline of farming in Great Britain for the benefit of overseas visitors to the International Conference of Agricultural Economists held at St. Andrews in September, 1936. There is no doubt, however, that this book will provide a much wider public with the most useful information on the various systems of farming to be found in this country. In the past, information of this kind has only been available in the form of Press articles or in bulletins and reports of various universities and agricultural colleges.

The book is, in reality, a collection of essays written, with one exception, by agricultural economists who are, or have recently been, stationed at the various advisory centres attached to universities or agricultural colleges in England, Wales and Scotland. These officers, through the very nature of their work, have a detailed knowledge of the agriculture and rural life of their respective provinces and are, therefore, in an authoritative position to give the reader a clear and concise outline of the subject on which they have been asked to write.

The editor realizes that one of the difficulties in bringing together such a collection of essays as these is to obtain uniformity in the presentation of the material. The editor, however, must have arranged with the contributors that the information should be presented in as similar a way as possible, with the result that one reads about the north of England and then moves on to the Midlands without feeling any appreciable difference in the presentation of the facts.

Within the compass of a brief essay it is quite impossible for the contributor to cover all aspects of farming, but the reader will find in any of these essays a very clear picture of the main systems practised and the conditions that gave rise to them. It is of more than passing interest to note that, since the introduction of recent legislation, the pace at which technical changes have taken place has been greatly accelerated.

The editor is to be congratulated on bringing together, in such a readable form, material collected and analyzed by men who are competent to interpret the changes that have taken place in farming and their effect in building up the systems we find practised in Great Britain to-day.

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Agriculture, General and Miscellaneous.

- The Place of Agriculture in Home Defence. *Viscount Lymington*. (J. Fmrs' Cl., Lond. Pt. 5 (Nov. 1936), pp. 77-93).
- World Agriculture and the Problems of Nutrition, with discussion. *F. L. McDougall*. (J. Proc. Agric. Econ. Soc. 4, 3 (Nov. 1936), pp. 203-222).
- The Relations of Land Tenure and Agriculture, with discussion. *H. M. Conacher*. (J. Proc. Agric. Econ. Soc. 4, 3 (Nov., 1936), pp. 167-201).
- The Lullingstone Silk Farm, with discussion. *Lady Hart Dyke*. (J. Roy. Soc. Arts, 85, 4388 (25 Dec. 1936), pp. 153-165).
- Empire Wines. *H. E. Laffer*. (J. Roy. Soc. Arts, 85, 4385 (4 Dec. 1936), pp. 77-96).
- Village Waste. *R. C. Wood*. (Emp. J. Exp. Agric. 4, 16 (Oct. 1936), pp. 357-363). With a note by *R. D. Anstead* (p. 364).
- Thatching and the Thatcher. *J. A. Miles*. (Estate Mag. 36, 11 (Nov. 1936), pp. 842-844).
- Wages in the Winchester Manors. *W. Beveridge*. (Econ. Hist. Rev. 7, 1 (Nov. 1936), pp. 22-43).

Agricultural Economics.

- Farm Economics. I. Agricultural Policy. II. Farm Management. III. Marketing, Prices and Supplies. IV. General. *C. S. Orwin*. (Fmrs' Guide Agric. Res. (in 1935), pp. 87-107).
- Research and Price Control, with discussion. *R. L. Cohen*. (J. Proc. Agric. Econ. Soc. 4, 3. (Nov. 1936), pp. 223-249).
- Organising Farm Workers. *J. F. Duncan*. (J. Proc. Agric. Econ. Soc. 4, 3 (Nov. 1936), pp. 250-358).
- Combine Harvesting Costs in 1935. *R. P. Askew*. (Fm. Econ. 2, 4 (Oct. 1936), pp. 53-57).
- Agrarkrisen und Stockungsspannen zur Frage der langen "Welle" in der wirtschaftlichen Entwicklung. *S. von Ciriacy-Wantrup*. (Ber. ü. Landw. (122 Sonderheft) (1936) (445 pp.)) (Agrarian Crises and Periods of Stagnation.)
- Labour Requirements on a Mechanised Wheat Farm. *H. Whitby*. (Scot. J. Agric. 19, 4 (Oct. 1936), pp. 349-358).

Agricultural Machinery.

- Farm Implements and Machinery. I. Power Farming. II. Tractors. III. Cultivating Implements. IV. Harvesting. V. Grass Conservation. VI. Electricity. VII. Miscellaneous. *S. J. Wright*. (Fmrs' Guide Agric. Res. (in 1935), pp. 60-86.)
- The Possession of Cattle and Agricultural Machinery by Tenants under Hire-Purchase Agreements. The Legal Position of the Landlord. *J. R. Smith-Saville*. (J. Land Agents' Soc. 35, 11 (Nov. 1936), pp. 624-639).

Soils and Fertilizers.

- Soils and Fertilizers. *Sir E. J. Russell*. (Fmrs' Guide Agric. Res. (in 1935), pp. 177-229.)
- Soil Science in the Twentieth Century. *J. Hendrick*. (Scot. J. Agric. 19, 4 (Oct. 1936), pp. 309-320).

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- The Action of Fertilisers on Turf. *T. W. Evans and I. G. Lewis.* (*Agrostologist* (Autumn, 1936), pp. 3-9).
Die Umsetzungen der Düngerkalks im Erdboden. *H. Kuron.* (*Landw. Jb.* 83, 5 (1936), pp. 601-710.) (The Changes of Lime Manure in the Soil.)
The Fertilizer Value of Some Concentrated Materials, particularly Urea and Guanidine and their Nitrates and Phosphates. *A. H. Lewis.* (*J. Agric. Sci.* 26, 4 (Oct. 1936), pp. 509-526).

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